UNIT TERMINAL OBJECTIVE

2-1 At the completion of this unit, the paramedic student will be able to establish and/ or maintain a patent airway, oxygenate, and ventilate a patient.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

2-1.1 Explain the primary objective of airway maintenance. (C-1)
2-1.2 Identify commonly neglected prehospital skills related to airway. (C-1)
2-1.3 Identify the anatomy of the upper and lower airway. (C-1)
2-1.4 Describe the functions of the upper and lower airway. (C-1)
2-1.5 Explain the differences between adult and pediatric airway anatomy. (C-1)
2-1.6 Define gag reflex. (C-1)
2-1.7 Explain the relationship between pulmonary circulation and respiration. (C-3)
2-1.8 List the concentration of gases that comprise atmospheric air. (C-1)
2-1.9 Describe the measurement of oxygen in the blood. (C-1)
2-1.10 Describe the measurement of carbon dioxide in the blood. (C-1)
2-1.11 Describe peak expiratory flow. (C-1)
2-1.12 List factors that cause decreased oxygen concentrations in the blood. (C-1)
2-1.13 List the factors that increase and decrease carbon dioxide production in the body. (C-1)
2-1.14 Define atelectasis. (C-1)
2-1.15 Define FiO_2. (C-1)
2-1.16 Define and differentiate between hypoxia and hypoxemia. (C-1)
2-1.17 Describe the voluntary and involuntary regulation of respiration. (C-1)
2-1.18 Describe the modified forms of respiration. (C-1)
2-1.19 Define normal respiratory rates and tidal volumes for the adult, child, and infant. (C-1)
2-1.20 List the factors that affect respiratory rate and depth. (C-1)
2-1.21 Explain the risk of infection to EMS providers associated with ventilation. (C-3)
2-1.22 Define pulsus paradoxes. (C-1)
2-1.23 Define and explain the implications of partial airway obstruction with good and poor air exchange. (C-1)
2-1.24 Define complete airway obstruction. (C-1)
2-1.25 Describe causes of upper airway obstruction. (C-1)
2-1.26 Describe causes of respiratory distress. (C-1)
2-1.27 Describe manual airway maneuvers. (C-1)
2-1.28 Describe the Sellick (cricoid pressure) maneuver. (C-1)
2-1.29 Describe complete airway obstruction maneuvers. (C-1)
2-1.30 Explain the purpose for suctioning the upper airway. (C-1)
2-1.31 Identify types of suction equipment. (C-1)
2-1.32 Describe the indications for suctioning the upper airway. (C-3)
2-1.33 Identify types of suction catheters, including hard or rigid catheters and soft catheters. (C-1)
2-1.34 Identify techniques of suctioning the upper airway. (C-1)
2-1.35 Identify special considerations of suctioning the upper airway. (C-1)
2-1.36 Describe the indications, contraindications, advantages, disadvantages, complications, equipment and technique of tracheobronchial suctioning in the intubated patient. (C-3)
2-1.37 Describe the use of an oral and nasal airway. (C-1)
2-1.38 Identify special considerations of tracheobronchial suctioning in the intubated patient. (C-1)
2-1.39 Define gastric distention. (C-1)
2-1.40 Describe the indications, contraindications, advantages, disadvantages, complications, equipment and

technique for inserting a nasogastric tube and orogastric tube. (C-1)
2-1.41 Identify special considerations of gastric decompression. (C-1)
2-1.42 Describe the indications, contraindications, advantages, disadvantages, complications, and technique for inserting an oropharyngeal and nasopharyngeal airway (C-1)
2-1.43 Describe the indications, contraindications, advantages, disadvantages, complications, and technique for ventilating a patient by: (C-1)
1. Mouth-to-mouth
2. Mouth-to-nose
3. Mouth-to-mask
4. One person bag-valve-mask
5. Two person bag-valve-mask
6. Three person bag-valve-mask
7. Flow-restricted, oxygen-powered ventilation device

2-1.44 Explain the advantage of the two person method when ventilating with the bag-valve-mask. (C-1)
2-1.45 Compare the ventilation techniques used for an adult patient to those used for pediatric patients. (C-3)
2-1.46 Describe indications, contraindications, advantages, disadvantages, complications, and technique for ventilating a patient with an automatic transport ventilator (ATV). (C-1)
2-1.47 Explain safety considerations of oxygen storage and delivery. (C-1)
2-1.48 Identify types of oxygen cylinders and pressure regulators (including a high-pressure regulator and a therapy regulator). (C-1)
2-1.49 List the steps for delivering oxygen from a cylinder and regulator. (C-1)
2-1.50 Describe the use, advantages and disadvantages of an oxygen humidifier. (C-1)
2-1.51 Describe the indications, contraindications, advantages, disadvantages, complications, liter flow range, and concentration of delivered oxygen for supplemental oxygen delivery devices. (C-3)
2-1.52 Define, identify and describe a tracheostomy, stoma, and tracheostomy tube. (C-1)
2-1.53 Define, identify, and describe a laryngectomy. (C-1)
2-1.54 Define how to ventilate with a patient with a stoma, including mouth-to-stoma and bag-valve-mask-to-stoma ventilation. (C-1)
2-1.55 Describe the special considerations in airway management and ventilation for patients with facial injuries. (C-1)
2-1.56 Describe the special considerations in airway management and ventilation for the pediatric patient. (C-1)
2-1.57 Differentiate endotracheal intubation from other methods of advanced airway management. (C-3)
2-1.58 Describe the indications, contraindications, advantages, disadvantages and complications of endotracheal intubation. (C-1)
2-1.59 Describe laryngoscopy for the removal of a foreign body airway obstruction. (C-1)
2-1.60 Describe the indications, contraindications, advantages, disadvantages, complications, equipment, and technique for direct laryngoscopy. (C-1)
2-1.61 Describe visual landmarks for direct laryngoscopy. (C-1)
2-1.62 Describe use of cricoid pressure during intubation. (C-1)
2-1.63 Describe indications, contraindications, advantages, disadvantages, complications, equipment and technique for digital endotracheal intubation. (C-1)
2-1.64 Describe the indications, contraindications, advantages, disadvantages, complications, equipment and technique for using a dual lumen airway. (C-3)
2-1.65 Describe the indications, contraindications, advantages, disadvantages, complications and equipment for

rapid sequence intubation with neuromuscular blockade. (C-1)
2-1.66 Identify neuromuscular blocking drugs and other agents used in rapid sequence intubation. (C-1)
2-1.67 Describe the indications, contraindications, advantages, disadvantages, complications and equipment for sedation during intubation. (C-1)
2-1.68 Identify sedative agents used in airway management. (C-1)
2-1.69 Describe the indications, contraindications, advantages, disadvantages, complications, equipment and technique for nasotracheal intubation. (C-1)
2-1.70 Describe the indications, contraindications, advantages, disadvantages and complications for performing an open crichothyrotomy. (C-3)
2-1.71 Describe the equipment and technique for performing an open cricothyrotomy. (C-1)
2-1.72 Describe the indications, contraindications, advantages, disadvantages, complications, equipment and technique for transtlaryngeal catheter ventilation (needle cricothyrotomy). (C-3)
2-1.73 Describe methods of assessment for confirming correct placement of an endotracheal tube. (C-1)
2-1.74 Describe methods for securing an endotracheal tube. (C-1)
2-1.75 Describe the indications, contraindications, advantages, disadvantages, complications, equipment and technique for extubation. (C-1)
2-1.76 Describe methods of endotracheal intubation in the pediatric patient. (C-1)

AFFECTIVE OBJECTIVES
At the completion of this unit, the paramedic student will be able to:

2-1.77 Defend the need to oxygenate and ventilate a patient. (A-1)
2-1.78 Defend the necessity of establishing and/ or maintaining patency of a patient's airway. (A-1)
2-1.79 Comply with standard precautions to defend against infectious and communicable diseases. (A-1)

PSYCHOMOTOR OBJECTIVES
At the completion of this unit, the paramedic student will be able to:

2-1.80 Perform body substance isolation (BSI) procedures during basic airway management, advanced airway management, and ventilation. (P-2)
2-1.81 Perform pulse oximetry. (P-2)
2-1.82 Perform end-tidal CO_2 detection. (P-2)
2-1.83 Perform peak expiratory flow testing. (P-2)
2-1.84 Perform manual airway maneuvers, including: (P-2)
a. Opening the mouth
b. Head-tilt/ chin-lift maneuver
c. Jaw-thrust without head-tilt maneuver
d. Modified jaw-thrust maneuver
2-1.85 Perform manual airway maneuvers for pediatric patients, including: (P-2)
a. Opening the mouth
b. Head-tilt/ chin-lift maneuver
c. Jaw-thrust without head-tilt maneuver
d. Modified jaw-thrust maneuver
2-1.86 Perform the Sellick maneuver (cricoid pressure). (P-2)
2-1.87 Perform complete airway obstruction maneuvers, including: (P-2)
a. Heimlich maneuver
2. Finger sweep
3. Chest thrusts

4. Removal with Magill forceps

2-1.88 Demonstrate suctioning the upper airway by selecting a suction device, catheter and technique. (P-2)
2-1.89 Perform tracheobronchial suctioning in the intubated patient by selecting a suction device, catheter and technique. (P-2)
2-1.90 Demonstrate insertion of a nasogastric tube. (P-2)
2-1.91 Demonstrate insertion of an orogastric tube. (P-2)
2-1.92 Perform gastric decompression by selecting a suction device, catheter and technique. (P-2)
2-1.93 Demonstrate insertion of an oropharyngeal airway. (P-2)
2-1.94 Demonstrate insertion of a nasopharyngeal airway. (P-2)
2-1.95 Demonstrate ventilating a patient by the following techniques: (P-2)
a. Mouth-to-mask ventilation
2. One person bag-valve-mask
3. Two person bag-valve-mask
4. Three person bag-valve-mask
5. Flow-restricted, oxygen-powered ventilation device
6. Automatic transport ventilator
7. Mouth-to-stoma
8. Bag-valve-mask-to-stoma ventilation
2-1.96 Ventilate a pediatric patient using the one and two person techniques. (P-2)
2-1.97 Perform ventilation with a bag-valve-mask with an in-line small-volume nebulizer. (P-2)
2-1.98 Perform oxygen delivery from a cylinder and regulator with an oxygen delivery device. (P-2)
2-1.99 Perform oxygen delivery with an oxygen humidifier. (P-2)
2-1.100 Deliver supplemental oxygen to a breathing patient using the following devices: nasal cannula, simple face mask, partial rebreather mask, non-rebreather mask, and venturi mask (P-2)
2-1.101 Perform stoma suctioning. (P-2)
2-1.102 Perform retrieval of foreign bodies from the upper airway. (P-2)
2-1.103 Perform assessment to confirm correct placement of the endotracheal tube. (P-2)
2-1.104 Intubate the trachea by the following methods: (P-2)
a. Orotracheal intubation
b. Nasotracheal intubation
c. Multi-lumen airways
9. Digital intubation
d. Transillumination
e. Open cricothyrotomy
2-1.105 Adequately secure an endotracheal tube. (P-1)
2-1.106 Perform endotracheal intubation in the pediatric patient. (P-2)
2-1.107 Perform transtracheal catheter ventilation (needle cricothyrotomy). (P-2)
2-1.108 Perform extubation. (P-2)
2-1.109 Perform replacement of a tracheostomy tube through a stoma. (P-2)

DECLARATIVE

I. Introduction
1. The body's need for oxygen
2. Primary objective of emergency care
   a. Ensure optimal ventilation
      (1) Delivery of oxygen
      (2) Elimination of CO_2
3. Brain death occurs within 6 to 10 minutes
4. Major prehospital causes of preventable death
   a. Early detection
   b. Early intervention
   c. Lay-person BLS education
5. Most often neglected of prehospital skills
   a. Basics taken for granted
   b. Poor techniques
      (1) BVM seal
      (2) Improper positioning
      (3) Failure to reassess

II. Anatomy of upper airway
1. Function of the upper airway
   a. Warm
   b. Filter
   c. Humidify
2. Pharynx
   a. Nasopharynx
      (1) Formed by the union of facial bones
      (2) Orientation of nasal floor is towards the ear not the eye
      (3) Separated by septum
      (4) Lined with
         (a) Mucous membranes
         (b) Cilia
      (5) Turbinate
         (a) Parallel to nasal floor
         (b) Provide increased surface area for air
            i) Filtration
            ii) Humidifying
            iii) Warming
      (6) Sinuses
         (a) Cavities formed by cranial bones
         (b) Appear to further trap bacteria and act as tributaries for fluid to and from Eustachian tubes and tear ducts
            i) Commonly become infected
            ii) Fracture of certain sinus bones may cause cerebrospinal fluid (CSF) leak
      (7) Tissues extremely delicate and vascular
         (a) Improper or overly aggressive placement of tubes or airways will cause significant bleeding which may not be controlled by direct pressure

b. Oropharynx
   (1) Teeth
      (a) 32 adult
      (b) Requires significant force to dislodge
      (c) May fracture or avulse causing obstruction
   (2) Tongue
      (a) Large muscle attached at the mandible and hyoid bones
      (b) Most common airway obstruction
   (3) Palate
      (a) Roof of mouth separates oro/ nasopharynx
         i) Anterior is hard palate
         ii) Posterior (beyond the teeth) is soft palate
   (4) Adenoids
      (a) Lymph tissue located in the mouth and nose that filters bacteria
      (b) Frequently infected and swollen
   (5) Posterior tongue
   (6) Epiglottis
   (7) Vallecula
      (a) "Pocket" formed by the base of the tongue and epiglottis
      (b) Important landmark for endotracheal intubation

3. Larynx
   a. Attached to hyoid bone
      (1) "Horseshoe-shaped" bone between the chin and mandibular angle
      (2) Supports trachea
      (3) Made of cartilage
   b. Thyroid cartilage
      (1) First tracheal cartilage
      (2) "Shield-shaped"
         (a) Cartilage anterior
         (b) Smooth muscle posterior
      (3) Laryngeal prominence
         (a) "Adam's Apple" anterior prominence of thyroid cartilage
         (b) Glottic opening directly behind
   c. Glottic opening
      (1) Narrowest part of adult trachea
      (2) Patency heavily dependent on muscle tone
      (3) Contain vocal bands
         (a) White bands of cartilage
         (b) Produce voice
   d. Arytenoid cartilage
      (1) "Pyramid-like" posterior attachment of vocal bands
      (2) Important landmark for endotracheal intubation
   e. Pyriform fossae
      (1) “Hollow pockets” along the lateral borders of the larynx
   f. Cricoid ring
      (1) First tracheal ring
      (2) Completely cartilaginous
      (3) Compression occludes esophagus (Sellick maneuver)
   g. Cricothyroid membrane

(1) Fibrous membrane between cricoid and thyroid cartilage
(2) Site for surgical and alternative airway placement

h. Associated structures
(1) Thyroid gland
(a) Located below cricoid cartilage
(b) Lies across trachea and up both sides
(2) Carotid arteries
(a) Branches cross and lie closely alongside trachea
(3) Jugular veins
(a) Branch across and lie close to trachea

III. Anatomy of lower airway
1. Function of the lower airway
a. Exchange of O_2 and CO_2
2. Location of the lower airway
a. From fourth cervical vertebrae to xiphoid process
b. From glottic opening to pulmonary capillary membrane
3. Structures of the lower airway
a. Trachea
(1) Trachea bifurcates at carina into
(a) Right and left mainstem bronchi
(b) Right mainstem has lesser angle
i) Foreign bodies, ET tubes commonly displace here
(2) Lined with
(a) Mucous cells
(b) Beta 2 receptors - dilate bronchioles
b. Bronchi
(1) Mainstem bronchi enter lungs at hilum
(2) Branch into narrowing secondary and tertiary bronchi that branch into bronchioles
c. Bronchioles
(1) Branch into alveolar ducts that end at alveolar sacs
d. Alveoli
(1) "Balloon-like" clusters
(2) Site of gas exchange
(3) Lined with surfactant
(a) Decreases surface tension of alveoli which facilitates ease of expansion
(b) Alveoli become thinner as they expand which makes diffusion of O_2/ CO_2 easier
(c) If surfactant is decreased or alveoli are not inflated, alveoli collapse (atelectasis)
e. Lungs
(1) Right lung
(a) 3 lobes
(2) Left lung
(a) 2 lobes
(3) Lobes made of parenchymal tissue
(4) Membranous outer lining called pleura
(5) Lung capacity

IV. Differences in pediatric airway
1. Pharynx

a. A proportionately smaller jaw causes the tongue to encroach upon the airway
b. Omega shaped, floppy epiglottis
c. Absent or very delicate dentition

2. Trachea
   a. Airway is smaller and narrower at all levels
   b. Larynx lies more superior
   c. Larynx is "funnel-shaped" due to narrow, undeveloped cricoid cartilage
   d. Narrowest point is at cricoid ring before 10 years of age
   e. Further narrowing of the airway by tissue swelling of foreign body results in major increase in airway resistance
3. Chest wall
   a. Ribs and cartilage are softer
   b. Cannot optimally contribute to lung expansion
   c. Infants and children tend to depend more heavily on the diaphragm for breathing

V. Lung/ respiratory volumes

1. Total lung volume
   a. Adult male, 6 liters
   b. Not all inspired air enters alveoli
   c. Minor diffusion of O_2 takes place in alveolar ducts and terminal bronchioles
2. Tidal volume
   a. Volume of gas inhaled or exhaled during a single respiratory cycle
   b. 5-7cc/ kg (500 cc normally)
3. Dead space air
   a. Air remaining in air passageways, unavailable for gas exchange (approximately 150cc)
   b. Anatomic dead space
      (1) Trachea
      (2) Bronchi
   c. Physiologic dead space
      (1) Dead space formed by factors like disease or obstruction
         (a) COPD
         (b) Atelectasis
4. Minute volume
   a. Amount of gas moved in and out of the respiratory tract per minute
   b. Determined by
      (1) Tidal volume - dead space volume times respiratory rate
5. Functional reserve capacity
   a. After optimal inspiration: optimum amount of air that can be forced from the lungs in a single exhalation
6. Residual volume
   a. Volume of air remaining in lungs at the end of maximal expiration
7. Alveolar air
   a. Air reaching the alveoli for gas exchange (alveolar volume)
   b. Approximately 350 cc
8. Inspiratory reserve
   a. Amount of gas that can be inspired in addition to tidal volume
9. Expiratory reserve
   a. Amount of gas that can be expired after a passive (relaxed) expiration
10. FiO_2

a. Percentage of oxygen in inspired air (increases with supplemental oxygen)
(1) Commonly documented as a decimal (e.g., FiO_2 = .85)

VI. Ventilation
1. Definition - movement of air into and out of the lungs
2. Phases
a. Inspiration
(1) Stimulus to breathe from respiratory center
(2) Impulse transmitted to diaphragm via phrenic nerve
(a) Diaphragm - "muscle of respiration"
(b) Separates thoracic from abdominal cavity
(3) Diaphragm contracts - "flattens"
(a) Causes intrapulmonic pressure to fall slightly below atmospheric pressure
(4) Intercostal muscles contract
(5) Ribs elevate and expand
(6) Air is drawn into lungs like a vacuum
(7) Alveoli Inflate
(8) O_2/ CO_2 are able to diffuse across membrane
b. Expiration
(1) Stretch receptors in lungs signal respiratory center via vagus nerve to inhibit inspiration (Hering-Breuer Reflex)
(2) Natural elasticity (recoil) of the lungs passively expires air

VII. Respiration
1. Definition
a. Exchange of gases between a living organism and its environment
b. The major gases of respiration are oxygen and carbon dioxide
2. Types
a. External respiration - exchange of gasses between the lungs and the blood cells
b. Internal respiration - exchange of gases between the blood cells and tissues
3. The transportation of oxygen and carbon dioxide in the human body
a. Diffusion - passage of solution from area of higher concentration to lower concentration
(1) O_2/ CO_2 dissolve in water and pass through alveolar membrane by diffusion
b. Oxygen content of blood
(1) Dissolved O_2 crosses pulmonary capillary membrane and binds to hemoglobin (Hgb) of red blood cell
(2) Oxygen is carried
(a) Bound to hemoglobin
(b) Dissolved in plasma
(3) Approximately 97% of total O_2 is bound to hemoglobin
(4) O_2 saturation
(a) % of hemoglobin saturated
(b) Normally greater than 98%
c. Oxygen in the blood
(1) Bound to hemoglobin
(a) SaO_2
(2) Dissolved in plasma
(a) PaO_2
d. Carbon dioxide content of the blood

(1) CO_2 is a byproduct of cellular work (cellular respiration)
(2) CO_2 is transported in blood as bicarbonate ion
(3) About 33% is bound to hemoglobin
(4) As O_2 crosses into blood, CO_2 diffuses into alveoli
(5) Carbon dioxide in the blood
(a) $PaCO_2$

e. Diagnostic testing
(1) Pulse oximetry
(2) Peak expiratory flow testing
(3) End-tidal CO_2 monitoring
(4) Other equipment

VIII. Causes of decreased oxygen concentrations in the blood
1. Lower partial pressure of atmospheric O_2
2. Lower hemoglobin levels in blood
3. Trauma
a. Less surface area for gas exchange
(1) Pneumothorax
(2) Hemothorax
(3) Combination of pneumothorax and hemothorax
b. Decreased mechanical effort
(1) Pain
(2) Traumatic suffocation
(3) Hypoventilation
4. Medical
a. Physiological barriers
(1) Pneumonia
(2) Pulmonary edema
(3) COPD

IX. Carbon dioxide in blood
1. Increases
a. Hypoventilation
2. Decreases
a. Hyperventilation

X. The measurement of gases
1. Total pressure
a. The combined pressure of all atmospheric gases
b. 100% or 760 torr at sea level
2. Partial pressure
a. The pressure exerted by a specific atmospheric gas
3. Concentration of gases in the atmosphere
a. Nitrogen 597.0 torr (78.62%)
b. Oxygen 159.0 torr (20.84%)
c. CO_2 0.3 torr (0.04%)
d. Water 3.7 torr (0.5%)
4. Water vapor pressure
5. Alveolar gas concentration

a. Nitrogen 569.0 torr (74.9%)
b. Oxygen 104.0 torr (13.7%)
c. CO_2 40.0 torr (5.2%)
d. Water 47.0 torr (6.2%)

XI. Respiratory rate
1. Definition - the number of times a person breathes in one minute
2. Neural control
   a. Primary control from the medulla and pons
   b. Medulla
      (1) Primary involuntary respiratory center
      (2) Connected to respiratory muscles by vagus nerve
   c. Pons
      (1) Apneustic center - secondary control center if medulla fails to initiate respiration
      (2) Pneumotaxic center - controls expiration
3. Chemical stimuli
   a. Receptors for O_2/ CO_2 balance
      (1) Cerebrospinal fluid pH
      (2) Carotid bodies (sinus)
      (3) Aortic arch
   b. Hypoxic drive - respiratory stimulus dependent on O_2 rather than CO_2 in the blood
4. Control of respiration by other factors
   a. Body temperature - respirations increase with fever
   b. Drug and medications - may increase or decrease respirations depending on their physiologic action
   c. Pain - increases respirations
   d. Emotion - increases respirations
   e. Hypoxia - increases respirations
   f. Acidosis - respirations increase as compensatory response to increased CO_2 production
   g. Sleep - respirations decrease

XII. Pathophysiology
1. Obstruction
   a. Tongue
      (1) Most common airway obstruction
      (2) Snoring respirations
      (3) Corrected with positioning
   b. Foreign body
      (1) May cause partial or full obstruction
      (2) Symptoms include
         (a) Choking
         (b) Gagging
         (c) Stridor
         (d) Dyspnea
         (e) Aphonia (unable to speak)
         (f) Dysphonia (difficulty speaking)
   c. Laryngeal spasm and edema
      (1) Spasm
         (a) Spasmotic closure of vocal cords

(b) Most frequently caused by
i) Trauma from over aggressive technique during intubation
ii) Immediately upon extubation especially when patient is semiconscious
(2) Edema
(a) Glottic opening becomes extremely narrow or totally obstructed
(b) Most frequently caused by
i) Epiglottitis (a bacterial infection of the epiglottis)
ii) Anaphylaxis (severe allergic reaction)
iii) Relieved by
(c) Aggressive ventilation
(d) Forceful upward pull of the jaw
(e) Muscle relaxants
d. Fractured larynx
(1) Airway patency dependent upon muscle tone
(2) Fractured laryngeal tissue
(a) Increases airway resistance by decreasing airway size through
i) Decreasing muscle tone
ii) Laryngeal edema
iii) Ventilatory effort
e. Aspiration
(1) Significantly increases mortality
(a) Obstructs airway
(b) Destroys delicate bronchiolar tissue
(c) Introduces pathogens
(d) Decreases ability to ventilate

XIII. Airway evaluation
1. Essential parameters
a. Rate
(1) Normal resting rate in adults - 12-24
b. Regularity
(1) Steady pattern
(2) Irregular respiratory patterns are significant until proven otherwise
c. Effort
(1) Breathing at rest should be effortless
(2) Effort changes may be subtle in rate or regularity
(3) Patients often compensate by preferential positioning
i) Upright sniffing
ii) Semifowlers
iii) Frequently avoid supine
2. Recognition of airway problems
a. Respiratory distress
(1) Upper and lower airway obstruction
(2) Inadequate ventilation
(3) Impairment of the respiratory muscles
(4) Impairment of the nervous system
b. Difficulty in rate, regularity, or effort is defined as dyspnea
c. Dyspnea may be result of or result in hypoxia
(1) Hypoxia - lack of oxygen

(2) Hypoxia - lack of oxygen to tissues
(3) Anoxia - total absence of oxygen

d. Recognition and treatment of dyspnea is crucial to patient survival
   (1) Expert assessment and management is essential
      (a) The brain can survive only a few minutes of anoxia
      (b) All therapies fail if airway is inadequate

e. Visual techniques
   (1) Position
      (a) Tripod positioning
      (b) Orthopnea
   (2) Rise and fall of chest
   (3) Gasping
   (4) Color of skin
   (5) Flaring of nares
   (6) Pursed lips
   (7) Retraction
      (a) Intercostal
      (b) Suprasternal notch
      (c) Supraclavicular fossa
      (d) Subcostal

f. Auscultation techniques
   (1) Air movement at mouth and nose
   (2) Bilateral lung fields equal

g. Palpation Techniques
   (1) Air movement at mouth and nose
   (2) Chest wall
      (a) Paradoxical motion
      (b) Retractions

h. Bag-valve-mask
   (1) Resistance or changing compliance with bag-valve-mask ventilations

i. Pulsus paradoxus
   (1) Systolic blood pressure drops greater than 10mm Hg with inspiration
      (a) Change in pulse quality maybe detected
      (b) Seen in COPD, pericardial tamponade
      (c) Possible increase in intrathoracic pressure

j. History
   (1) Evolution
      (a) Sudden
      (b) Gradual over time
      (c) Known cause or "trigger"
   (2) Duration
      (a) Constant
      (b) Recurrent
   (3) Ease - what makes it better?
   (4) Exacerbate - what makes it worse?
   (5) Associate
      (a) Other symptoms (productive cough, chest pain, fever, etc...)
   (6) Interventions
      (a) Evaluations/ admissions to hospital

(b) Medications (include compliance)
(c) Ever intubated

k. Modified forms of respiration
(1) Protective reflexes
(a) Cough
i) Forceful, spastic exhalation
ii) Aids in clearing bronchi and bronchioles
(b) Sneeze - clears nasopharynx
(c) Gag reflex - spastic pharyngeal and esophageal reflex from stimulus of the posterior pharynx
(2) Sighing
(a) Involuntary deep breath that increases opening of alveoli
(b) Normally sigh about once per minute
(3) Hiccough - intermittent spastic closure of glottis

l. Respiratory pattern changes
(1) Cheyne-Stokes
(a) Gradually increasing rate and tidal volume followed by gradual decrease
(b) Associated with brain stem insult
(2) Kussmaul's breathing
(a) Deep, gasping respirations
(b) Common in diabetic coma
(3) Biot's respirations
(a) Irregular pattern, rate, and volume with intermittent periods of apnea
(b) Increased intracranial pressure
(4) Central neurogenic hyperventilation
(a) Deep rapid respirations similar to Kussmall's
(b) Increased intracranial pressure
(5) Agonal
(a) Slow, shallow, irregular respirations
(b) Resulting from brain anoxia

m. Inadequate ventilation
(1) Occurs when body cannot compensate for increased O_2 demand or maintain O_2/ CO_2 balance
(2) Many causes
(a) Infection
(b) Trauma
(c) Brainstem insult
(d) Noxious or hypoxic atmosphere
(e) Renal failure
(3) Multiple symptoms
(a) Altered response
(b) Respiratory rate changes (up or down)

XIV. Supplemental oxygen therapy
1. Rationale
a. Enriched O_2 atmosphere increases oxygen to cells
b. Increasing available O_2 increases patient's ability to compensate
c. O_2 delivery method must be reassessed to determine adequacy and efficiency
2. Oxygen source

a. Compressed gas
   (1) Oxygen compressed in gas form in an aluminum or steel tank
   (2) Common sizes and volumes
      (a) D 400L
      (b) E 660L
      (c) M 3450L
   (3) O_2 delivery measured in liters/ min (LPM)
   (4) Calculating tank life
      (a) Tank pressure (psi) x 0.28 = volume
      (b) Volume/ LPM = tank life in minutes

b. Liquid oxygen
   (1) O_2 cooled to its aqueous state
      (a) Converts to gaseous state when warmed
   (2) Advantage
      (a) Much larger volume of gaseous O_2 can be stored in aqueous state
   (3) Disadvantage
      (a) Units generally require upright storage
      (b) Special requirements for large volume storage and cylinder transfer

3. Regulators
   a. High-pressure
      (1) Attached to cylinder stem delivers cylinder gas under high pressure
      (2) Used to transfer cylinder gas from tank to tank
   b. Therapy regulators
      (1) Attached to cylinder stem
      (2) 50psi escape pressure is "stepped down" through regulator mechanism
      (3) Subsequent delivery to patient is adjustable low pressure
4. Delivery devices
   a. Nasal cannula
      (1) Nasally placed O_2 catheter for oxygen enrichment
      (2) Optimal delivery: 40% at 6 L/ min
      (3) Indications
         (a) Low to moderate O_2 enrichment
         (b) Long term O_2 maintenance therapy
      (4) Contraindications
         (a) Poor respiratory effort
         (b) Severe hypoxia
         (c) Apnea
         (d) Mouth breathing
      (5) Advantages
         (a) Well tolerated
      (6) Disadvantages
         (a) Does not deliver high volume/ high concentration
   b. Simple face mask
      (1) Full airway enclosure with open side ports
         (a) Room air is drawn through side ports on inspiration
         (b) Diluting O_2 concentration
      (2) Indications
         (a) Delivery of moderate to high O_2 concentrations
         (b) Range - 40-60% at 10 L/ min

(3) Advantages
(a) Higher O_2 concentrations
(4) Disadvantages
(a) Delivery of volumes beyond 10 L/ min does not enhance O_2 concentration
(5) Special considerations
(a) Mask leak around face decreases O_2 concentration

c. Partial rebreather
(1) Mask vent ports covered by one-way disc
(a) Residual expired air mixed in mask and rebreathed
(b) Room air not entrained with inspiration
(2) Indications
(3) Contraindications
(a) Apnea
(b) Poor respiratory effort
(4) Advantages
(a) Inspired gas not mixed with room air
i) Higher O_2 concentrations attainable
(b) Disadvantages
i) Delivery of volumes beyond 10 L/ min does not enhance O_2 concentration
(c) Special considerations
i) Mask leak around face decreases O_2 concentration

d. Non-rebreather mask
(1) Mask side ports covered by one-way disc
(2) Reservoir bag attached
(3) Range: 80-95+% at 15 L/ min
(4) Indications
(a) Delivery of highest O_2 concentration
(5) Contraindications
(a) Apnea
(b) Poor respiratory effort
(6) Advantages
(a) Highest O_2 concentration
(b) Delivers high volume/ high O_2 enrichment
(c) Patient inhales enriched O_2 from reservoir bag rather than residual air
(7) Disadvantages

e. Venturi mask
(1) Mask with interchangeable adapters
(a) Adapters have port holes that entrain room air as O_2 passes
(b) Patient receives a highly specific concentration of O_2
(c) Air is entrained by venturi principle

f. Small volume nebulizer
(1) Delivers aerosolized medication
(2) O_2 enters an aerosol chamber containing 3-5 ccs of fluid
(3) Pressurized O_2 mists fluid

5. Oxygen humidifiers
a. Sterile water reservoir for humidifying O_2
b. Good for long term O_2 administration
c. Desirable for croup/ Epiglottitis/ bronchiolitis

6. Tracheostomy, stoma, and tracheostomy tubes
   a. Tracheostomy
      (1) Surgical opening into trachea
         (a) Done in operating room under controlled conditions
         (b) A stoma located just superior to the suprasternal notch
   b. Stoma
      (1) Resultant orifice connecting trachea to outside air
      (2) Patient now breathes through this surgical opening
   c. Tracheostomy tube
      (1) Plastic tube placed within tracheostomy site
      (2) 15 mm connector for ventilator acceptance

XV. Ventilation

1. Mouth-to-mouth
   a. Most basic form of ventilation
   b. Indications
      (1) Apnea from any mechanism when other ventilation devices are not available
   c. Contraindications
      (1) Awake patients
      (2) Communicable disease risk limitations
   d. Advantages
      (1) No special equipment required
      (2) Delivers excellent tidal volume
      (3) Delivers adequate oxygen
   e. Disadvantages
      (1) Psychological barriers from
         (a) Sanitary issues
         (b) Communicable disease issues
            i) Direct blood/ body fluid contact
            ii) Unknown communicable disease risks at time of event
   f. Complications
      (1) Hyperinflation of patient's lungs
      (2) Gastric distension
      (3) Blood/ body fluid contact manifestation
      (4) Hyperventilation of rescuer
2. Mouth-to-nose
   a. Ventilating through nose rather than mouth
   b. Indications
      (1) Apnea from any mechanism
   c. Contraindications
      (1) Awake patients
   d. Advantages
      (1) No special equipment required
   e. Disadvantages
      (1) Direct blood/ body fluid contact
      (2) Psychological limitations of rescuer
   f. Complications
      (1) Hyperinflation of patient's lungs
      (2) Gastric distension

(3) Blood/ body fluid manifestation
(4) Hyperventilation of rescuer

3. Mouth-to-mask
   a. Adjunct to mouth-to-mouth ventilation
   b. Indications
      (1) Apnea from any mechanism
   c. Contraindications
      (1) Awake patients
   d. Advantages
      (1) Physical barrier between rescuer and patient blood/ body fluids
      (2) One-way valve to prevent blood/ body fluid splash to rescuer
      (3) May be easier to obtain face seal
   e. Disadvantages
      (1) Useful only if readily available
   f. Complications
      (1) Hyperinflation of patient's lungs
      (2) Hyperventilation of rescuer
      (3) Gastric distention
   g. Method for use
      (1) Position head by appropriate method
      (2) Position and seal mask over mouth and nose
      (3) Ventilate as appropriate
4. One person bag-valve-mask
   a. Fixed volume self inflating bag can deliver adequate tidal volumes and O_2 enrichment
   b. Indications
      (1) Apnea from any mechanism
      (2) Unsatisfactory respiratory effort
   c. Contraindications
      (1) Awake, intolerant patients
   d. Advantages
      (1) Excellent blood/ body fluid barrier
      (2) Good tidal volumes
      (3) Oxygen enrichment
      (4) Rescuer can ventilate for extended periods without fatigue
   e. Disadvantages
      (1) Difficult skill to master
      (2) Mask seal may be difficult to obtain and maintain
      (3) Tidal volume delivered is dependent on mask seal integrity
   f. Complications
      (1) Inadequate tidal volume delivery with
         (a) Poor technique
         (b) Poor mask seal
         (c) Gastric distention
   g. Method for use
      (1) Position appropriately
      (2) Choose proper mask size - seats from bridge of nose to chin
      (3) Position, spread/ mold/ seal mask
      (4) Hold mask in place
      (5) Squeeze bag completely over 1.5 to 2 seconds for adults

(6) Avoid overinflation
(7) Reinflate completely over several seconds

h. Special considerations
(1) Medical
(a) Observe for
i) Gastric distension
ii) Changes in compliance of bag with ventilation
iii) Improvement or deterioration of ventilation status (i.e., color change, responsiveness, air leak around mask)
(2) Trauma
(a) Very difficult to perform with cervical spine immobilization in place

5. Two person bag-valve-mask ventilation method
a. Most efficient method
b. Indications
(1) Bag-valve-mask ventilation on any patient
(a) Especially useful for cervical spine immobilized patients
(b) Difficulty obtaining or maintaining adequate mask seal
c. Contraindications
(1) Awake, intolerant patients
d. Advantages
(1) Superior mask seal
(2) Superior volume delivery
e. Disadvantages
(1) Requires extra personnel
f. Complications
(1) Hyperinflation of patient's lungs
(2) Gastric distension
g. Method for use
(1) First rescuer maintains mask seal by appropriate method
(2) Second rescuer squeezes bag
h. Special considerations
(1) Observe chest movement
(2) Avoid overinflation
(3) Monitor lung compliance with ventilations

6. Three person bag-valve-mask ventilation
a. Indications
(1) Bag-valve-mask ventilation on any patient
(a) Especially useful for cervical spine immobilized patients
(b) Difficulty obtaining or maintaining adequate mask seal
b. Contraindications
(1) Awake, intolerant patients
c. Advantages
(1) Superior mask seal
(2) Superior volume density
d. Disadvantages
(1) Requires extra personnel
(2) “Crowded” around airway
e. Complications
(1) Hyperinflation of patient’s lungs

(2) Gastric distension
f. Method for use
(1) First rescuer maintains mask seal by appropriate method
(2) Second rescuer holds mask in place
(3) Third rescuer squeezes bag and monitors compliance
g. Special considerations
(1) Avoid overinflation
(2) Monitor lung compliance with ventilations

7. Flow-restricted, oxygen-powered ventilation devices
a. The valve opening pressure at the cardiac sphincter is approx 30 cm H_2O
b. These devices operate at or below 30 cm H_2O to prevent gastric distension
c. Indications
(1) Delivery of high volume/ high concentration of O_2 (1 L/ sec)
(2) Awake compliant patients
(3) Unconscious patient with caution
d. Contraindications
(1) Noncompliant patients
(2) Poor tidal volume
(3) Small children
e. Advantages
(1) Self administered
(2) Delivers high volume/ high concentration O_2
(3) O_2 delivered in response to inspiratory effort (no O_2 wasting)
(4) O_2 volume delivery is regulated by inspiratory effort minimizing overinflation risk
(5) O_2 volume delivery is also restricted to less than 30 cm H_2O
f. Disadvantages
(1) Cannot monitor lung compliance
(2) Requires O_2 source
g. Complications
(1) Gastric distension
(2) Barotrauma
h. Method
(1) Mask is held manually in place
(2) Negative pressure upon inspiration triggers O_2 delivery or medic triggers release button
(3) Patient is monitored for adequate tidal volume and oxygenation

8. Automatic transport ventilators
a. Volume/ rate controlled
b. Indications
(1) Extended ventilation of intubated patients
(2) In situations in which a BVM is used
(3) Can be used during CPR
c. Contraindications
(1) Awake patients
(2) Obstructed airway
(3) Increased airway resistance
(a) Pneumothorax (after needle decompression)
(b) Asthma
(c) Pulmonary edema
d. Advantages

(1) Frees personnel to perform other tasks
(2) Lightweight
(3) Portable
(4) Durable
(5) Mechanically simple
(6) Adjustable tidal volume
(7) Adjustable rate
(8) Adapts to portable O_2 tank

e. Disadvantages
(1) Cannot detect tube displacement
(2) Does not detect increasing airway resistance
(3) Difficult to secure
(4) Dependent on O_2 tank pressure

9. Cricoid pressure - Sellick's maneuver
a. Pressure on cricoid Ring
b. Occludes esophagus
c. Facilitates intubation by moving the larynx posteriorly
d. Helps to prevent passive emesis
e. Can help minimize gastric distension during bag-valve-mask ventilation
f. Indications
(1) Vomiting is imminent or occurring
(2) Patient cannot protect own airway
g. Contraindications
(1) Use with caution in cervical spine injury
h. Advantages
(1) Noninvasive
(2) Protects from aspiration as long as pressure is maintained
i. Disadvantages
(1) May have extreme emesis if pressure is removed
(2) Second rescuer required for bag-valve-mask ventilation
(3) May further compromise injured cervical spine
j. Complications
(1) Laryngeal trauma with excessive force
(2) Esophageal rupture from unrelieved high gastric pressures
(3) Excessive pressure may obstruct the trachea in small children
k. Method
(1) Locate the anterior aspect of the cricoid ring
(2) Apply firm, posterior pressure
(3) Maintain pressure until the airway is secured with an endotracheal tube

10. Artificial ventilation of the pediatric patient
a. Flat nasal bridge makes achieving mask seal more difficult
b. Compressing mask against face to improve mask seal results in obstruction
c. Mask seal best achieved with jaw displacement (two person bag-valve-mask)
d. Bag-valve-mask ventilation
(1) Bag size
(a) Full-term neonates and infants - minimum of 450 ml tidal volume (pediatric BVM)
(b) Children up to eight years of age - pediatric BVM preferred but adult-sized BVM (1500 ml) may be used
(c) Children over eight years of age require adult-sized BVM for adequate ventilation

(d) Proper mask fit
(e) Length based resuscitation tape
(f) Bridge of nose to cleft of chin
(2) Proper mask position and seal (EC-clamp)
(a) Place mask over mouth and nose; avoid compressing the eyes
(b) Using one hand, place thumb on mask at apex and index finger on mask at chin (C-grip)
(c) With gentle pressure, push down on mask to establish adequate seal
(d) Maintain airway by lifting bony prominence of chin with remaining fingers forming an "E"; avoid placing pressure on the soft area under chin
(e) May use one or two rescuer technique
(3) Ventilate according to current standards
(4) Obtain chest rise with each breath
(a) Begin ventilation and say "squeeze"; provide just enough volume to initiate chest rise; DO NOT OVERVENTILATE
(5) Allow adequate time for exhalation
(a) Begin releasing the bag and say "release, release"
(6) Continue ventilations using "squeeze, release, release" method
(7) Assess BVM ventilation
(a) Look for adequate chest rise
(b) Listen for lung sounds at third intercostal space, midaxillary line
(c) Assess for improvement in color and/ or heart rate
(8) Apply cricoid pressure to minimize gastric inflation and passive regurgitation
(a) Locate cricoid ring by palpating the trachea for a prominent horizontal band inferior to the thyroid cartilage and cricothyroid membrane
(b) Apply gentle downward pressure using one fingertip in infants and the thumb and index finger in children
(c) Avoid excessive pressure as it may produce tracheal compression and obstruction in infants

11. Ventilation of stoma patients
a. Mouth-to-stoma
(1) Locate stoma site and expose
(2) Pocket mask to stoma preferred
(a) Seal around stoma site, check for adequate ventilation
(b) Seal mouth and nose if air leak evident
b. Bag-valve-mask to stoma
(1) Locate stoma site and expose
(2) Seal around stoma site, check for adequate ventilation
(3) Seal mouth and nose if air leak evident

XVI. Airway obstructions
1. Causes
a. Tongue
b. Foreign body
c. Laryngeal spasm
d. Laryngeal edema
e. Trauma
2. Classifications/ assessment
a. Complete obstruction

b. Partial obstruction
(1) With good air exchange
(2) With poor air exchange

3. Management
a. Heimlich maneuver
b. Finger sweep
c. Chest thrusts
d. Suctioning
e. Direct laryngoscopy for the removal of foreign body in airway obstruction
(1) If patient is unconscious and you are unable to ventilate and BLS methods fail
(a) Insert laryngoscope blade into patient's mouth
(b) If foreign body is visualized carefully and deliberately remove foreign body with Magill forceps
f. Intubation

XVII. Suctioning
1. Suction devices
a. Hand-powered suction devices
(1) Advantages
(a) Lightweight
(b) Portable
(c) Mechanically simple
(d) Inexpensive
(2) Disadvantages
(a) Limited volume
(b) Manually powered
(c) Fluid contact components not disposable
b. Oxygen-powered portable suction devices
(1) Advantages
(a) Lightweight
(b) Small in size
(2) Disadvantages
(a) Limited suctioning power
(b) Uses a lot of oxygen for limited suctioning power
c. Battery-operated portable suction devices
(1) Advantages
(a) Lightweight
(b) Portable
(c) Excellent suction power
(d) May "field" troubleshoot most problems
(2) Disadvantages
(a) More complicated mechanics
(b) May lose battery integrity over time
(c) Some fluid contact components not disposable
d. Mounted vacuum-powered suction devices
(1) Advantages
(a) Extremely strong vacuum
(b) Adjustable vacuum power
(c) Fluid contact components disposable

(2) Disadvantages
(a) Non-portable
(b) Cannot "field service" or substitute power source

2. Suctioning catheters
   a. Hard or rigid catheters
      (1) "Yankauer" or "tonsil tip"
      (2) Suction large volumes of fluid rapidly
      (3) Standard size
      (4) Various sizes
   b. Soft catheters
      (1) Can be placed in oropharynx, nasopharynx, or down endotracheal tube
      (2) Various sizes
      (3) Smaller inside diameter than hard tip catheters
      (4) Suction tubing without catheter (facilitates suctioning of large debris)
3. Suctioning the upper airway
   a. Prevention of aspiration critical
      (1) Mortality increases significantly if aspiration occurs
      (2) Preoxygenate if possible
      (3) Hyperoxygenate after suctioning
   b. Description
      (1) Soft tip catheters must be prelubricated
      (2) Place catheter
      (3) Suction during extraction of catheter
      (4) Suction to clear the airway
      (5) Reevaluate patency of the airway
      (6) Ventilate and oxygenate
4. Tracheobronchial suctioning
   a. Use sterile technique, if possible
   b. Preoxygenation essential
   c. Description
      (1) Pre-lubricate soft tip catheter
      (2) Hyperoxygenate
         (a) May be necessary to inject 3 to 5 ccs of sterile water down endotracheal tube to loosen secretions
      (3) Gently insert catheter until resistance is felt
      (4) Suction upon extraction of catheter
      (5) Do not exceed 15 seconds
      (6) Ventilate and oxygenate
5. Gastric distention
   a. Air becomes trapped in the stomach
   b. Very common when ventilating non-intubated patients
   c. Stomach diameter increases
   d. Pushes against diaphragm
   e. Interferes with lung expansion
   f. Abdomen becomes increasingly distended
   g. Resistance to bag-valve-mask ventilation
   h. Management
      (1) Non-invasive
         (a) May be reduced by increasing bag-valve-mask ventilation time

i) Adults - 1.5 to 2 seconds
ii) Pediatrics - 1 to 1.5 seconds
(b) Prepare for large volume suction
(c) Position patient left lateral
(d) Slowly apply pressure to epigastric region
(e) Suction as necessary

(2) Gastric tubes
(a) Tube placed in the stomach for gastric decompression and/ or emesis control
(b) Nasogastric decompression
i) Indications
a) Threat of aspiration
b) Need for lavage
ii) Contraindications
a) Extreme caution in esophageal disease or esophageal trauma
b) Facial trauma (caution)
c) Esophageal obstruction
iii) Advantages
a) Tolerated by awake patients
b) Does not interfere with intubation
c) Mitigates recurrent gastric distension
d) Mitigates nausea
e) Patient can still talk
iv) Disadvantages
a) Uncomfortable for patient
b) May cause patient to vomit during placement even if gag is suppressed
c) Interferes with BVM seal
v) Complications
a) Nasal, esophageal or gastric trauma from poor technique
b) Endotracheal placement
c) Supragastric placement
d) Tube obstruction
vi) Method
a) Prepare patient
b) Head neutral
c) Oxygenate
d) Suppress gag with topical anaesthetic or IV lidocaine
e) Anesthetize and dilate nares
f) Lubricate tube
g) Advance gently along nasal floor
h) Encourage patient to swallow or drink to facilitate passage
i) Advance into stomach
j) Confirm placement
k) Auscultate while injecting 30-50 ccs of air
l) Note gastric contents through tube
m) No reflux around tube
n) Secure in place
(c) Orogastric decompression

i) Indications
   a) Same parameters as NG
   b) Generally preferred for unconscious patients
ii) Contraindications
   a) Same parameters as NG
iii) Advantages
   a) May use larger tubes
   b) May lavage more aggressively
   c) Safe to pass in facial fracture
   d) Avoids nasopharynx
iv) Disadvantages
   a) May interfere with visualization during Intubation
v) Method
   a) Neutral or flexed head position
   b) Introduce tube down midline
   c) Procedure same as NG
vi) Complications
   a) Same as NG
   b) Patient may bite tube

XVIII. Airway management
1. Manual maneuvers
   a. Head-tilt/ chin-lift maneuver
      (1) Technique
         (a) Tilt head back
         (b) Lift chin forward
         (c) Open mouth
      (2) Indications
         (a) Unresponsive patients who
            i) Do not have mechanism for c-spine injury
            ii) Unable to protect their own airway
      (3) Contraindications
            i) Awake patients
            ii) Possible c-spine injury
      (4) Advantages
         (a) No equipment required
         (b) Simple
         (c) Safe
         (d) Non-invasive
      (5) Disadvantages
         (a) Head tilt hazardous to c-spine injured patients
         (b) Does not protect from aspiration
   b. Jaw-thrust without head-tilt maneuver
      (1) Technique
         (a) Head is maintained neutral
         (b) Jaw is displaced forward
         (c) Lift by grasping under chin and behind teeth
         (d) Mouth opened
      (2) Indications

(a) Patients who are
i) Unresponsive
ii) Unable to protect their own airway
iii) May have c-spine injury
(3) Contraindications
(a) Responsive patients
(b) Resistance to opening mouth
(4) Advantages
(a) May be used in c-spine injury
(b) May be performed with cervical collar in place
(c) Does not require special equipment
(5) Disadvantages
(a) Cannot maintain if patient becomes responsive or combative
(b) Difficult to maintain for extended period
(c) Very difficult to use in conjunction with bag-valve-mask ventilation
(d) Thumb must remain in patient's mouth in order to maintain displacement
(e) Separate rescuer required to perform bag-valve-mask ventilation
(f) Does not protect against aspiration

c. Modified jaw-thrust maneuver
(1) Technique
(a) Head maintained neutral
(b) Jaw is displaced forward at mandibular angle
(2) Indications
(a) Unresponsive
(b) Cervical spine Injury
(c) Unable to protect own airway
(d) Resistance to opening mouth
(3) Contraindications
(a) Awake patients
(4) Advantages
(a) Non-invasive
(b) Requires no special equipment
(c) May be used with cervical collar in place
(5) Disadvantages
(a) Difficult to maintain
(b) Requires second rescuer for bag-valve-mask ventilation
(c) Does not protect against aspiration

2. Nasal airway
a. Soft rubber with beveled tip
(1) Distal tip rests in hypopharynx
(2) For adults, length measured from nostril to earlobe
(3) Diameter roughly equal to patient's little finger
b. Indications
(1) Unconscious patients
(2) Altered response patients with suppressed gag reflex
c. Contraindications
(1) Patient intolerance
(2) Caution in presence of facial fracture or skull fracture
d. Advantages

(1) Can be suctioned through
(2) Provides patent airway
(3) Can be tolerated by awake patients
(4) Can be safely placed "blindly"
(5) Does not require mouth to be open

e. Disadvantages
(1) Poor technique may result in severe bleeding
(a) Resulting epistaxis may be extremely difficult to control
(2) Does not protect from aspiration

f. Placement
(1) Determine correct length and diameter
(2) Lubricate nasal airway
(3) With bevel towards septum, insert gently along the nasal floor parallel to the mouth
(4) Do not force
(5) Measurement from corner of the mouth to the jaw angle rather than tip of the ear
(6) Too long airway causes airway obstruction

3. Oral airway
a. Hard plastic airway designed to prevent the tongue from obstructing glottis
b. Indications
(1) Unconscious patients
(2) Absent gag reflex
c. Contraindications
(1) Conscious patients
d. Advantages
(1) Non-invasive
(2) Easily placed
(3) Prevents blockage of glottis by tongue
e. Disadvantages
(1) Does not prevent aspiration
(2) Unexpected gag may produce vomiting
f. Complications
(1) Unexpected gag may produce vomiting
(2) Pharyngeal or dental trauma with poor technique
g. Placement
(1) Open mouth
(2) Remove visible obstructions
(3) Place with distal tip toward glottis using tongue depressor as adjunct
(4) Alternate method - place airway with distal tip toward palate and rotate into place
h. Pediatrics
(1) Place with tongue depressor
(2) Place with tip toward tongue, not palate

4. Endotracheal tube
a. Tube passed into the trachea in order to provide externally controlled breathing through a BVM or ventilator
(1) Sizes
(a) 2.5-9.0 mm inside diameter (id)
(b) Length 12-32 cm
(2) Types
(a) Cuffed 5.0-9.0

i) Proximal end 15 mm adapter
ii) Proximal end inflation port with pilot balloon
iii) Cm markings along length
iv) Distal end beveled tip
v) Distal end balloon cuff

(b) Uncuffed 2.5-4.5
i) Proximal end 15 mm adapter
ii) Distal end bevel tip
iii) Distal end depth markings
iv) No balloon cuff or pilot balloon

b. Indications
(1) Present or impending respiratory failure
(2) Apnea
(3) Failure to protect own airway

c. Contraindications

d. Advantages
(1) Provides a secure airway
(2) Protects against aspiration
(3) Route for medication

e. Disadvantages
(1) Special equipment needed
(2) Bypasses physiologic function of upper airway
(a) Warming
(b) Filtering
(c) Humidifying

f. Complications
(1) Bleeding
(2) Laryngeal swelling
(3) Laryngospasm
(4) Vocal cord damage
(5) Mucosal necrosis
(6) Barotrauma

g. Techniques of insertion
(1) Orotracheal intubation by direct laryngoscopy
(a) Directly visualizing the passage of an ET tube into the trachea
(b) Indications
i) Apnea
ii) Hypoxia
iii) Poor respiratory effort
iv) Suppression or absence of gag reflex
(c) Contraindications
i) Caution in unsuppressed gag reflex
(d) Advantages
i) Direct visualization of anatomy and tube placement
ii) Ideal method for confirming placement
iii) May be performed in breathing and apneic patients
(e) Disadvantages
i) Requires special equipment
(f) Complications

i) Dental trauma
ii) Laryngeal trauma
iii) Misplacement
a) Right mainstem
b) Esophageal

(g) Equipment
i) Laryngoscope
a) Device used to visualize glottis during endotracheal intubation
b) Battery pack/ handle with interchangeable blades
c) Blade types
d) Straight (Miller) lifts epiglottis
e) Curved (MacIntosh) lifts epiglottis by fitting into vallecula
ii) 10 cc syringe to inflate/ deflate balloon cuff
iii) Water soluble lubricant to lubricate endotracheal tube, promote ease of passage, and decrease trauma
iv) Stylet - semi-rigid wire for molding and maintaining tube shape
v) Securing device
a) Tape
b) Commercially available endotracheal tube holder
vi) Suction
vii) Body substance precautions
a) Gloves
b) Mask
c) Eyewear or faceshield

h. Endotracheal intubation technique
(1) Medical patient
(a) Orotracheal intubation by direct laryngoscopy
(b) Place patient supine in sniffing position to facilitate visualization
(c) Method
i) Position used when the potential for c-spine injury does not exist
a) Sniffing position
b) Optimal hyperextension of head with elevation of occiput
c) Brings the axes of the mouth, the pharynx, and the trachea into alignment
ii) When potential for c-spine injury exists head is held firmly in neutral position during intubation
iii) Ensure optimal oxygenation and ventilation with 100% O_2
iv) Ensure all equipment is prepared
a) Lubricated tube with stylet in place
b) Best position is "hockey stick"
c) Bend directly behind balloon cuff
d) Working laryngoscope
e) Blade locks securely in place
f) Light is bright and steady (unpleasant to look at)
g) Test cuff by inflating and then deflating
v) Ideally, hyperoxygenate patient for 30 seconds to 1 minute
vi) Insert laryngoscope blade
a) Gently insert to hypopharynx
b) Lift tongue and jaw with firm, steady pressure

c) Avoid fulcrum against teeth
vii) Identify vocal cords
viii) Gently pass ET tube until observe passage of balloon cuff past cords
ix) Remove stylet
x) Inflate balloon cuff
xi) Ventilate patient
xii) Confirm placement with multiple methods
xiii) Reconfirm placement with major patient movement or head movement

(2) Nasotracheal intubation
(a) Passage of ET tube through nasopharynx into trachea
(b) Indications
i) Breathing patients requiring intubation
(c) Contraindications
i) Caution with facial trauma
ii) Caution with deviated septum
(d) Advantages
i) Does not require laryngoscope
ii) Does not require sniffing position
iii) More easily secured
iv) Patient cannot bite tube
(e) Disadvantages
i) "Blind" technique
ii) Can only be performed on breathing patients
(f) Method
i) Patient's head is placed in neutral position
ii) Standard pre-intubation precautions
a) Suction
b) Oxygenation
c) Equipment preparation
iii) Preform tube
a) Bend into circle while preparing patient
b) Use endotrol tube
c) Endotracheal tube with attached line that adjusts direction of the distal tip (substitutes for stylet)
iv) Hyperoxygenate
v) Gently insert lubricated tube
a) Bevel towards septum
b) Along nasal floor
c) Through largest or most compliant nostril
vi) Advance tube until loudest exchange of air is heard (approximately 15cm)
a) May need to slightly rotate tube
vii) Advance tube through vocal cords on inspiration
viii) Inflate cuff
ix) Confirm placement
x) Secure tube

(3) Digital intubation
(a) Direct palpation of glottic structures to intubate trachea
(b) Indications
i) Apnea

ii) Confined space
iii) Inability to directly visualize
(c) Contraindications
i) Breathing patient
ii) Present gag reflex
(d) Advantages
i) Does not require laryngoscope
ii) Does not require sniffing position
iii) May be passed through fluid obstructions
(e) Disadvantages
i) Semi-blind technique
ii) May only be done on apneic patients
(f) Method
i) Pre-intubation precautions
ii) Open mouth
a) Extending tongue with gauze will facilitate palpation of glottis
iii) Palpate and lift epiglottis
iv) Palpate arytenoid cartilage
v) Pass tube between epiglottis and arytenoids
vi) Inflate balloon cuff
vii) Confirm placement
viii) Secure tube
(4) Transillumination techniques (lighted stylet)
(a) Use of a lighted stylet to transilluminate the glottis and facilitate intubation
(b) Indications
i) Inability to directly visualize glottis
ii) Cervical spine injury
(c) Contraindications
i) Present gag reflex
ii) Airway obstruction
(d) Advantages
i) Minimal manipulation of cervical spine
ii) Adds visual parameter to blind technique
(e) Disadvantages
i) Difficult in bright light
(f) Method
i) Pre-intubation precautions
ii) Place patient in neutral position
iii) Bend tube into "J"
iv) Turn on stylet
a) Insert midline into pharynx
v) Observe for focused midline glow
vi) Advance additional 1-2 cm
vii) Remove stylet
viii) Inflate balloon cuff
ix) Confirm placement
x) Secure tube

i. Confirming placement
(1) Methods

(a) Direct re-visualization
  i) Re-visualize glottis
  ii) Note tube depth
    a) Average tube depth in males is 22 cm at the teeth
    b) Average tube depth in women is 21 cm
(b) Note condensation in the tube
(c) Auscultation
  i) Epigastric area
    a) Air entry into stomach indicates esophageal placement
  ii) Bilateral bases
    a) Equal volume and expansion
  iii) Apices
    a) Equal volume
  iv) Unequal or absent breath sounds indicate
    a) Esophageal placement
    b) Right mainstem placement
    c) Pneumothorax
    d) Bronchial obstruction
(d) Palpation of balloon cuff at sternal notch by compressing pilot balloon
(e) Pulse oximetry
(f) Expired CO_2
  i) Measures presence of CO_2 in expired air
    a) Colormetric
    b) Digital
    c) Digital/ waveform
(g) Bag-valve-mask ventilation compliance
  i) Increased resistance to BVM compliance may indicate
    a) Gastric distension
    b) Esophageal placement
    c) Tension pneumothorax

(2) Evidence of a misplaced tube regardless when it was last checked must be reconfirmed
(3) Confirmation must be performed
(a) By multiple methods
(b) Immediately after tube placement
(c) After any major move
(d) After manipulation of neck (manipulation of neck may displace tube up to 5 cm)

j. Corrective measures
(1) Esophageal placement
(a) Ready to vigorously suction as needed
(b) Likelihood of emesis is increased especially if gastric distension is present
(c) Ideally preoxygenate prior to reintubation
(d) Misplaced tube may be removed after proper tracheal placement is confirmed or it may be removed beforehand provided diligent and vigorous airway suctioning is ready
(2) Right mainstem placement
(a) Loosen or remove securing device
(b) Deflate balloon cuff
(c) While ventilation continues, SLOWLY retract tube while simultaneously listening for breath sounds over left chest

(d) STOP as soon as breath sounds are heard in left chest
(e) Note tube depth
(f) Reinflate balloon cuff
(g) Secure tube

k. Securing the tube
(1) As critical as the intubation itself
(2) Multiple methods and products available
(3) Adjuncts include
(a) Securing to maxilla rather than mandible
(b) Tincture of benzoin to facilitate tape adhesion

l. Field extubation
(1) Generally, the only reason to field extubate is the patient is unreasonably intolerant of the tube
(2) Awake patients are at high risk of laryngospasm immediately following extubation
(3) There may be a problem re-inducting and re-intubating a laryngospastic patient
(4) Indications
(a) Able to protect and maintain airway
(b) Risks for need to reintubate significantly reduce
(c) Must not be sedated
(5) Contraindications
(a) Any risk of recurrence of respiratory failure
(6) Complications
(a) Highest risk of recurrence of laryngospasm is immediately post extubation
(b) Respiratory distress or failure may return necessitating re-intubation
(7) Method
(a) Ensure oxygenation
(b) Intubation equipment and suction immediately available
(c) Confirm patient responsiveness
(d) Suction oropharynx
(e) Deflate cuff
(f) Remove upon cough or expiration
(8) Special considerations
(a) Need for field extubation is extremely rare
(b) Intolerance of ET tube evidenced by gag reflex should be addressed by increasing sedation rather than removing tube

m. Pediatric endotracheal intubation
(1) Laryngoscope and size appropriate blades
(a) Straight blades are preferred
(b) General guidelines
i) Premature infant - 0 straight
ii) Full-term infant to one year of age - 1 straight
iii) Two years of age to adolescent - 2 straight
iv) Adolescent and above - 3 straight or curved
(2) Appropriate size endotracheal tube
(a) Formula = (16 + age in years) ÷ 4
(b) Anatomical clues
(c) General guidelines
i) Premature infant - 2.5 to 3.0 uncuffed
ii) Full-term infant - 3.0 to 3.5 uncuffed

iii) Infant to one year of age - 3.5 to 4.0 uncuffed
iv) Toddler - 4.0 to 5.0 uncuffed
v) Preschool - 5.0 to 5.5 uncuffed
vi) School age - 5.5 to 6.5 uncuffed
vii) Adolescent - 7.0 to 8.0 cuffed

(d) Depth of insertion
i) 2-3 cm below the vocal cords
a) Uncuffed - place the black glottic marker of the tube at the level of the vocal cords
b) Cuffed - insert until the cuff is just below the vocal cords
ii) 3 x inside diameter - 1
iii) General guidelines
a) Premature infant - 8 cm
b) Full-term infant - 8 to 9.5 cm
c) Infant to one year of age - 9.5 to 11 cm
d) Toddler - 11 to 12.5 cm
e) Preschool - 12.5 to 14 cm
f) School age - 14 to 20 cm
g) Adolescent - 20 to 23 cm

(e) Appropriate sized endotracheal tube stylet

(3) Endotracheal tube securing device
(a) Tape
(b) Commercial device

(4) Technique
(a) Separate parent/ guardian and patient
(b) Manually open airway
(c) Insert appropriate airway adjunct if needed
(d) Ventilate patient with 100% oxygen via age appropriate sized bag
(e) Place the patient's head in the sniffing position
(f) Pre-oxygenate the patient with 100% oxygen a minimum of 30 seconds
(g) Prepare all equipment
i) Lubricate endotracheal tube with sterile water/ saline or water-soluble gel
ii) Lubricate stylet if utilized
(h) Insert the laryngoscope to the right side of the mouth and sweep the tongue to the left side
(i) Lift tongue with firm, steady pressure
i) Avoid fulcrum against teeth or gums
(j) Use the tip of the blade to lift epiglottitis
(k) Identify the vocal cords
(l) Introduce the endotracheal tube to the right side of the mouth
(m) Pass the tube through the vocal cords to about 2-3 cm below the vocal cords
(n) Confirm proper tube placement
i) Observe for symmetrical chest expansion
ii) Auscultate for equal breath sounds over each lateral chest wall high in the axillae
iii) Absence of breath sounds over the abdomen
iv) Improved heart rate and color
v) If available, end-tidal carbon dioxide detector
(o) Secure tube noting placement of distance marker at teeth/ gums

(p) Reconfirm tube placement

5. Multi-lumen airways
   a. Pharyngo-tracheal lumen airway (PTL)
      (1) An endotracheal tube encased in a large pharyngeal tube
      (2) Designed to be passed blindly
      (3) Dual ventilation ports provide means to ventilate regardless of whether the ET tube is placed in the esophagus or the trachea
      (4) Indications
         (a) Alternative airway control when conventional intubation procedures are not available or successful
      (5) Advantages
         (a) Can ventilate with tracheal or esophageal placement
         (b) No facemask to seal
         (c) No special equipment
         (d) Does not require sniffing position
      (6) Disadvantages
         (a) Cannot be used in awake patients
         (b) Adults only
         (c) Pharyngeal balloon mitigates but does not eliminate aspiration risk
         (d) Can only be passed orally
         (e) Extremely difficult to intubate around
      (7) Method
         (a) Head neutral
         (b) Pre-intubation precautions
         (c) Insert at the midline using jaw-lift
         (d) Ventilate through pharyngeal tube (green) first
            i) Chest rise indicates ET tube is in esophagus
               a) Inflate pharyngeal balloon and ventilate
            ii) No chest rise indicates ET tube in trachea
               a) Inflate ET tube balloon cuff
               b) Ventilate through ET tube
      (8) Complications
         (a) Pharyngeal or esophageal trauma from poor technique
         (b) Unrecognized displacement of ET tube into esophagus
         (c) Displacement of pharyngeal balloon
      (9) Special considerations
         (a) Good assessment skills are essential to properly confirm placement
         (b) Mis-identification of placement has been reported
         (c) Reinforce multiple confirmation of placement techniques
   b. Combitube
      (1) Pharyngeal and endotracheal tube molded into a single unit
      (2) Indications
         (a) Alternative airway control when conventional intubation measures are unsuccessful or unavailable
      (3) Contraindications
         (a) Children too small for the tube
         (b) Esophageal trauma or disease
         (c) Caustic ingestion
      (4) Advantages

(a) Rapid insertion
(b) No special equipment
(c) Does not require sniffing position

(5) Disadvantages
(a) Impossible to suction trachea when tube is in esophagus
(b) Adults only
(c) Unconscious only
(d) Very difficult to intubate around

(6) Method
(a) Head - neutral position
(b) Pre-intubation precautions
(c) Insert with jaw-lift at midline
(d) Inflate pharyngeal cuff with 100 ccs of air
(e) Inflate distal cuff with 10-15 ccs of air
(f) Ventilate through longest tube first (pharyngeal)
i) Chest rise indicates esophageal placement of distal tip
ii) No chest rise indicates tracheal placement, switch ports and ventilate

(7) Special considerations
(a) Good assessment skills are essential to confirm proper placement
(b) Mis-identification of placement has been reported
(c) Reinforce multiple confirmation techniques

XIX. Pharmacological adjuncts to airway management and ventilation

1. Sedation in emergency intubation

a. Sedatives are used in airway management to
(1) Reduce anxiety
(2) Induce amnesia
(3) Decrease the gag reflex

b. Indications
(1) Combative patients
(2) Patients who require aggressive airway management but who are too conscious to tolerate intubation
(3) Agitated patients

c. Contraindications
(1) Known sensitivity to the medications

d. Advantages
(1) Decreases anxiety
(2) Induces amnesia

e. Disadvantages
(1) Respiratory depression
(2) Vomiting/ aspiration

f. Pharmacology
(1) Decreases anxiety
(2) Increases patient compliance
(3) Often produces amnesia to procedure
(4) Enhances ease of intubation
(5) Types of medications used
(a) Haloperidol
(b) Barbiturates

(c) Benzodiazepines
(d) Etomidate
(e) Narcotics
(f) Ketamine

g. Complications
(1) Airway compromise
(2) Regurgitation/ aspiration
(3) Loss of protective reflexes
(4) Sedating patient with tenuous airway may completely collapse what airway they have

h. Method

2. Neuromuscular blockade in emergency intubation
a. The use of neuromuscular blocking agents to induce skeletal muscle paralysis
b. The patient is much easier to intubate once paralyzed
c. Indications
(1) Combative patients who need to be intubated
d. Contraindications
(1) Absolute
(a) Inability to ventilate once paralyzed
(2) Relative
(a) Patients who will be difficult to ventilate (i.e. facial hair, etc)
(b) Patients who will be difficult to intubate (short necks, etc.)
e. Advantages
(1) Enables the paramedic to intubate some patients who need aggressive airway management (i.e. head injury, etc.) but may be otherwise uncooperative
f. Disadvantages
(1) Paralysis of the diaphragm/ apnea
(2) Inability of the patient to protect their own airway
g. Pharmacology
(1) Skeletal muscles contract in response to nerve stimulus
(2) Junction of muscle and nerve fiber is neuromuscular junction
(3) Acetylcholine (ACH) allows nerve impulse to cross neuromuscular junction
(4) Neuromuscular blockade relaxes muscle by impeding the action of ACH
(5) Does not provide sedation
(6) Types
(a) Depolarizing agents
i) Substitute themselves into neuromuscular junction
ii) May cause fasciculations (uncontrollable muscle twitching)
iii) Examples
a) Succinylcholine
b) Rapid onset/ short duration (90 seconds/ 5-10 minutes)
c) Use with caution in burns, crush, blunt trauma (hyperkalemia)
(b) Non-depolarizing agents
i) Block uptake of ACH into junction
ii) Do not cause fasciculations
iii) Examples
a) Vecuronium
b) Rapid onset - 2 minutes
c) Short duration - 45 minutes

d) Pancuronium
e) Rapid onset - 3-5 minutes
f) Longer duration - 1 hour

h. Complications
(1) Inability to intubate
(2) Inability to ventilate
(3) Vomiting
(4) Airway compromise

i. Method for rapid sequence intubation

XX. Translaryngeal cannula ventilation

1. High volume/ high pressure ventilation of lungs through cannulation of trachea below the glottis
   a. Oxygen delivery differs from other methods
   b. Delivers a large volume of O_2 through a small port
   c. Delivers a very high pressure to the lungs compared to other methods (50 psi versus less than 1 psi through a regulator)
2. Indications
   a. Apnea
   b. Delayed or inability to ventilate the patient by other means
3. Contraindications
   a. Total airway obstruction (both inspiratory and expiratory)
   b. Equipment not immediately available
4. Advantages
   a. Rapidly performed
   b. Provides adequate ventilation when performed properly
   c. Does not manipulate the cervical spine
   d. Does not interfere with subsequent attempts to intubate
5. Disadvantages
   a. Requires jet ventilator
   b. Expends high volumes of oxygen more rapidly
   c. May not protect against aspiration
6. Equipment
   a. Large bore IV catheter (14-16 gauge)
   b. 10 cc syringe
   c. 3 ccs of water or saline (optional)
   d. Oxygen source (50 psi)
   e. Jet ventilator
7. Method
   a. Prepare equipment
   b. Identify cricothyroid membrane
   c. Insert needle with syringe midline through cricothyroid membrane at a slight angle towards sternum
   d. Withdraw on syringe plunger until air is freely withdrawn (bubbles if fluid is in syringe)
   e. Advance additional 1 cm
   f. Hold needle steady, advance catheter to hub
   g. Attach jet ventilator
   h. Ventilate once per five seconds
      (1) Exhalation is passive through the glottis
8. Complications

a. Bleeding
(1) From improper catheter placement
b. Subcutaneous emphysema
(1) From excessive air leak around catheter site or undetected laryngeal trauma
c. Airway obstruction
(1) Result of excessive bleeding or subcutaneous air which compresses trachea
d. Barotrauma
(1) Resulting from overinflation
e. Hypoventilation

XXI. Cricothyrotomy
1. Surgical access to the airway through the cricothyroid membrane
2. Indications
a. Total upper airway obstruction (epiglotitis, acute anaphylaxis, respiratory tract burns, etc.)
b. Massive facial trauma
c. Delayed or inability to intubate or ventilate the patient by other means
d. Contraindication to intubation
e. Posterior laceration of the tongue
f. Inability to open the mouth
3. Contraindications
a. Inability to identify anatomical landmarks
b. Crush injury to the larynx
c. Tracheal transection
d. Underlying anatomical abnormality (trauma, tumor, subglottic stenosis, etc.)
4. Advantages
a. Rapidly performed
b. Much faster and technically easier than tracheostomy
c. Does not manipulate the cervical spine
5. Disadvantages
a. Difficult to perform in children
b. Difficult to perform on patients with short, muscular, or fat necks
6. Equipment
a. Endotracheal or tracheostomy tube
b. Scalpel
c. Curved hemostats
d. Suction apparatus
7. Method
8. Complications
a. Incorrect tube placement/ false passage
b. Thyroid gland damage
c. Severe bleeding
d. Subcutaneous emphysema
e. Laryngeal nerve damage

XXII. Special patient considerations
1. Patients with larngectomies (stomas)
a. Mucous plug
(1) Laryngeotomies possess less efficient cough
(2) Mucous commonly obstructs tubes

(3) Tube may be removed/ cleaned and replaced

b. Stenosis
(1) Stoma spontaneously narrows
(a) Potentially life-threatening
(b) Soft tissue swelling decreases stoma diameter
(2) Trach tube is difficult or impossible to replace
(3) ET tube must be placed before total obstruction

c. Suctioning
(1) Must be done with extreme caution if laryngeal edema is suspended
(2) Procedure
(a) Preoxygenate
(b) Inject 3 cc sterile saline down trachea
(c) Instruct patient to exhale
(d) Insert suction catheter until resistance detected
(e) Instruct patient to cough or exhale
(f) Suction during withdrawal

d. Tube replacement
(1) Lubricate appropriately sized tracheostomy tube or ET tube (5.0 or larger)
(2) Instruct patient to exhale
(3) Gently insert tube about 1-2 cm beyond balloon cuff
(4) Inflate balloon cuff
(5) Confirm comfort, patency and proper placement
(6) Ensure false lumen was not created

2. Dental appliances
a. Dentures, partial plates, etc.
b. Best removed before intubation

3. Airway management considerations for patients with facial injuries
a. Facial injuries suggest the possibility of cervical spine injury
(1) In-line stabilization
(a) Trauma technique endotracheal intubation
b. Foreign body/ blood in oropharynx
(1) Suction airway
c. Inability to ventilate/ intubate orally
(1) Requires surgical intervention

UNIT TERMINAL OBJECTIVE

3-1 At the completion of this unit, the paramedic student will be able to use the appropriate techniques to obtain a medical history from a patient.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

3-1.1 Describe the techniques of history taking. (C-1)
3-1.2 Discuss the importance of using open ended questions. (C-1)
3-1.3 Describe the use of facilitation, reflection, clarification, empathetic responses, confrontation, and interpretation. (C-1)
3-1.4 Differentiate between facilitation, reflection, clarification, sympathetic responses, confrontation, and interpretation. (C-3)
3-1.5 Describe the structure and purpose of a health history. (C-1)
3-1.6 Describe how to obtain a comprehensive health history. (C-1)
3-1.7 List the components of a comprehensive history of an adult patient. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

3-1.8 Demonstrate the importance of empathy when obtaining a health history. (A-1)
3-1.9 Demonstrate the importance of confidentiality when obtaining a health history. (A-1)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

I. Overview
   - A. Purpose
     1. This information is gathered on a patient by patient, case by case basis
   - B. Several parts
     1. Specific purpose
     2. Together they give structure
   - C. Does not dictate sequence

II. Content of the patient history
   - A. Date
     1. Always important
     2. Time may also be a consideration
   - B. Identifying data
     1. Age
     2. Sex
     3. Race
     4. Birthplace
     5. Occupation
   - C. Source of referral
     1. Patient referral
     2. Referral by others
   - D. Source of history
     1. Patient
     2. Family
     3. Friends
     4. Police
     5. Others
   - E. Reliability
     1. Variable
        - a. Memory
        - b. Trust
        - c. Motivation
     2. Made at the end of the evaluation, not the beginning
   - F. Chief complaint
     1. Main part of the health history
     2. The one or more symptoms for which the patient is seeking medical care for
   - G. Present illness
     1. Identifies chief complaint
     2. Provides a full, clear, chronological account of the symptoms
   - H. Past history
     1. General state of health
     2. Childhood illnesses
     3. Adult illnesses
     4. Psychiatric illnesses
     5. Accidents and injuries

6. Operations
7. Hospitalizations

I. Current health status
   1. Focuses on present state of health
   2. Environmental conditions
   3. Personal habits
      a. Current medications
      b. Allergies
      c. Tobacco use
      d. Alcohol, drugs and related substances
      e. Diet
      f. Screening tests
      g. Immunizations
      h. Sleep patterns
      i. Exercise and leisure activities
      j. Environmental hazards
      k. Use of safety measures
      l. Family history
      m. Home situation and significant other
      n. Daily life
      o. Important experiences
      p. Religious beliefs
      q. Patients outlook

J. Review of body systems

III. Techniques of history taking
   A. Setting the stage
      1. Reviewing the medical history
         a. Briefly review any previous medical records available
         b. Important insight
            (1) Referral
            (2) Life experience
            (3) Past diagnosis and treatment
      2. The environment
         a. Proper environment enhances communication
         b. Place for you and the patient to sit
         c. Be cautious of power relationship
         d. Personal space
      3. Your demeanor and appearance
         a. Just as you are watching the patient, the patient will be watching you
         b. Messages of body language
         c. Clean, neat, professional appearance
      4. Note taking
         a. Difficult to remember all details
         b. Most patients are comfortable with note taking
            (1) If concerns arise, explain your purpose
            (2) Do not divert your attention from the patient to take notes

B. Learning about the present illness
  1. Greeting the patient
    a. Greet by name
    b. Shake hands
    c. Avoid the use of unfamiliar or demeaning terms such as Granny or Hon, etc.
  2. The patient's comfort
    a. Be alert to patient comfort levels
    b. Inquire about the patient's feelings
    c. Watch for signs of uneasiness
  3. Opening questions
    a. Find out why the patient is seeking medical care or advice
    b. Use a general, open-ended question
    c. Follow the patient's leads
      (1) Facilitation
        (a) Your posture, actions or words should encourage the patient to say more
        (b) Making eye contact or saying phrases such as "Go-on" or "I'm listening" may help the patient to continue
      (2) Reflection
        (a) Repetition of the patient's words that encourage additional responses
        (b) Typically does not bias the story or interrupt the patient's train of thought
      (3) Clarification
        (a) Used to clarify ambiguous statements or words
      (4) Empathetic responses
        (a) Use techniques of therapeutic communication to interpret feelings and your response
      (5) Confrontation
        (a) Some issues or response may require you to confront patients about their feelings
      (6) Interpretation
        (a) Goes beyond confrontation, requires you to make an inference
      (7) Asking about feelings
  4. Getting more information
    a. Attributes of a symptom
      (1) Location
        (a) Where is it
        (b) Does it radiate
      (2) Quality
        (a) What is it like
      (3) Quantity or severity
        (a) How bad is it
        (b) Attempt to quantify the pain
          i) 1 - 10 scale
          ii) Other scales
      (4) Timing

(a) When did it start
(b) How long does it last
(5) The setting in which it occurs
(a) Emotional response
(b) Environmental factors
(6) Factors that make it better or worse
(7) Associated manifestations

C. Clinical reasoning
1. Results of questioning may allow you to think about associated problems and body systems
D. Direct questions
1. To gather additional information, direct questions may be required
2. Should not be leading questions
3. Ask one question at a time
4. Use language that is appropriate
E. Taking a history on sensitive topics
1. Alcohol and drugs
2. Physical abuse or violence
3. Sexual history

IV. Special challenges
A. Silence
1. Silence is often uncomfortable
2. Silence has meaning and many uses
a. Patients may use this to collect their thoughts, remember details or decide whether or not they trust you
b. Be alert for nonverbal clues of distress
3. Silence may be a result of the interviewer's lack of sensitivity
B. Overly talkative patients
1. Faced with a limited amount of time interviewers may become impatient
2. Although there are no perfect solutions, several techniques may be helpful
a. Lower your goals, accept a less comprehensive history
b. Give the patient free reign for the first several minutes
c. Summarize frequently
C. Patients with multiple symptoms
D. Anxious patients
1. Anxiety is natural
2. Be sensitive to nonverbal clues
E. Reassurance
1. It is tempting to be overly reassuring
2. Premature reassurance blocks communication
F. Anger and hostility
1. Understand that anger and hostility are natural
2. Often the anger is displaced toward the clinician
3. Do not get angry in return
G. Intoxication
1. Be accepting not challenging

2. Do not attempt to have the patient lower their voice or stop cursing; this may aggravate them
3. Avoid trapping them in small areas

H. Crying
1. Crying, like anger and hostility may provide valuable insight
2. Be sympathetic

I. Depression
1. Be alert for signs of depression
2. Be sure you know how bad it is

J. Sexually attractive or seductive patients
1. Clinicians and patients may be sexually attracted to each other
2. Accept these as normal feelings, but prevent them from affecting your behavior
3. If a patient becomes seductive or makes sexual advances, frankly but firmly make clear that your relationship is professional not personal

K. Confusing behaviors or histories
1. Be prepared for the confusion and frustration of varying behaviors and histories
2. Be alert for mental illness, delirium or dementia

L. Limited intelligence
1. Do not overlook the ability of these patients to provide you with adequate information
2. Be alert for omissions
3. Severe mental retardation may require you to get information from family or friends

M. Language barriers
1. Take every possible step to find a translator
2. A few broken words are not an acceptable substitute

N. Hearing problems
1. Very similar to patients with a language barrier
2. If the patient can sign, make every effort to find a translator

O. Blind patients
1. Be careful to announce yourself and to explain who you are and why you are there

P. Talking with family and friends
1. Some patients may not be able to provide you with all information
2. Try to find a third party who can help you get the whole story

UNIT TERMINAL OBJECTIVE

3-2 At the completion end of this unit, the paramedic student will be able to explain the pathophysiological significance of physical exam findings.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

3-2.1 Define the terms inspection, palpation, percussion, auscultation. (C-1)
3-2.2 Describe the techniques of inspection, palpation, percussion, and auscultation. (C-1)
3-2.3 Describe the evaluation of mental status. (C-1)
3-2.4 Evaluate the importance of a general survey. (C-3)
3-2.5 Describe the examination of skin, hair and nails. (C-1)
3-2.6 Differentiate normal and abnormal findings of the assessment of the skin. (C-3)
3-2.7 Distinguish the importance of abnormal findings of the assessment of the skin. (C-3)
3-2.8 Describe the examination of the head and neck. (C-1)
3-2.9 Differentiate normal and abnormal findings of the scalp examination. (C-3)
3-2.10 Describe the normal and abnormal assessment findings of the skull. (C-1)
3-2.11 Describe the assessment of visual acuity. (C-1)
3-2.12 Explain the rationale for the use of an ophthalmoscope. (C-1)
3-2.13 Describe the examination of the eyes. (C-1)
3-2.14 Distinguish between normal and abnormal assessment findings of the eyes. (C-3)
3-2.15 Explain the rationale for the use of an otoscope. (C-1)
3-2.16 Describe the examination of the ears. (C-1)
3-2.17 Differentiate normal and abnormal assessment findings of the ears. (C-3)
3-2.18 Describe the examination of the nose. (C-1)
3-2.19 Differentiate normal and abnormal assessment findings of the nose. (C-3)
3-2.20 Describe the examination of the mouth and pharynx. (C-1)
3-2.21 Differentiate normal and abnormal assessment findings of the mouth and pharynx. (C-3)
3-2.22 Describe the examination of the neck. (C-1)
3-2.23 Differentiate normal and abnormal assessment findings the neck. (C-3)
3-2.24 Describe the survey of the thorax and respiration. (C-1)
3-2.25 Describe the examination of the posterior chest. (C-1)
3-2.26 Describe percussion of the chest. (C-1)
3-2.27 Differentiate the percussion notes and their characteristics. (C-3)
3-2.28 Differentiate the characteristics of breath sounds. (C-3)
3-2.29 Describe the examination of the anterior chest. (C-1)
3-2.30 Differentiate normal and abnormal assessment findings of the chest examination. (C-3)
3-2.31 Describe special examination techniques related to the assessment of the chest. (C-1)
3-2.32 Describe the examination of the arterial pulse including rate, rhythm, and amplitude. (C-1)
3-2.33 Distinguish normal and abnormal findings of arterial pulse. (C-3)
3-2.34 Describe the assessment of jugular venous pressure and pulsations. (C-1)
3-2.35 Distinguish normal and abnormal examination findings of jugular venous pressure and pulsations. (C-3)
3-2.36 Describe the examination of the heart and blood vessels. (C-1)
3-2.37 Differentiate normal and abnormal assessment findings of the heart and blood vessels. (C-3)
3-2.38 Describe the auscultation of the heart. (C-1)
3-2.39 Differentiate the characteristics of normal and abnormal findings associated with the auscultation of the heart. (C-3)
3-2.40 Describe special examination techniques of the cardiovascular examination. (C-1)

3-2.41 Describe the examination of the abdomen. (C-1)
3-2.42 Differentiate normal and abnormal assessment findings of the abdomen. (C-3)
3-2.43 Describe auscultation of the abdomen. (C-1)
3-2.44 Distinguish normal and abnormal findings of the auscultation of the abdomen. (C-3)
3-2.45 Describe the examination of the female genitalia. (C-1)
3-2.46 Differentiate normal and abnormal assessment findings of the female genitalia. (C-3)
3-2.47 Describe the examination of the male genitalia. (C-1)
3-2.48 Differentiate normal and abnormal findings of the male genitalia. (C-3)
3-2.49 Describe the examination of the anus and rectum. (C-3)
3-2.50 Distinguish between normal and abnormal findings of the anus and rectum. (C-3)
3-2.51 Describe the examination of the peripheral vascular system. (C-1)
3-2.52 Differentiate normal and abnormal findings of the peripheral vascular system. (C-3)
3-2.53 Describe the examination of the musculoskeletal system. (C-1)
3-2.54 Differentiate normal and abnormal findings of the musculoskeletal system. (C-3)
3-2.55 Describe the examination of the nervous system. (C-1)
3-2.56 Differentiate normal and abnormal findings of the nervous system. (C-3)
3-2.57 Describe the assessment of the cranial nerves. (C-1)
3-2.58 Differentiate normal and abnormal findings of the cranial nerves. (C-3)
3-2.59 Describe the general guidelines of recording examination information. (C-1)
3-2.60 Discuss the considerations of examination of an infant or child. (C-1)

AFFECTIVE OBJECTIVES
At the completion of this unit, the paramedic student will be able to:

3-2.61 Demonstrate a caring attitude when performing physical examination skills. (A-3)
3-2.62 Discuss the importance of a professional appearance and demeanor when performing physical examination skills. (A-1)
3-2.63 Appreciate the limitations of conducting a physical exam in the out-of-hospital environment. (A-2)

PSYCHOMOTOR OBJECTIVES
At the completion of this unit, the paramedic student will be able to:

3-2.64 Demonstrate the examination of skin, hair and nails. (P-2)
3-2.65 Demonstrate the examination of the head and neck. (P-2)
3-2.66 Demonstrate the examination of the eyes. (P-2)
3-2.67 Demonstrate the examination of the ears. (P-2)
3-2.68 Demonstrate the assessment of visual acuity. (P-2)
3-2.69 Demonstrate the examination of the nose. (P-2)
3-2.70 Demonstrate the examination of the mouth and pharynx. (P-2)
3-2.71 Demonstrate the examination of the neck. (P-2)
3-2.72 Demonstrate the examination of the thorax and ventilation. (P-2)
3-2.73 Demonstrate the examination of the posterior chest. (P-2)
3-2.74 Demonstrate auscultation of the chest. (P-2)
3-2.75 Demonstrate percussion of the chest. (P-2)
3-2.76 Demonstrate the examination of the anterior chest. (P-2)
3-2.77 Demonstrate special examination techniques related to the assessment of the chest. (P-2)
3-2.78 Demonstrate the examination of the arterial pulse including location, rate, rhythm, and amplitude. (P-2)
3-2.79 Demonstrate the assessment of jugular venous pressure and pulsations. (P-2)

3-2.80 Demonstrate the examination of the heart and blood vessels. (P-2)
3-2.81 Demonstrate special examination techniques of the cardiovascular examination. (P-2)
3-2.82 Demonstrate the examination of the abdomen. (P-2)
3-2.83 Demonstrate auscultation of the abdomen. (P-2)
3-2.84 Demonstrate the external visual examination of the female genitalia. (P-2)
3-2.85 Demonstrate the examination of the male genitalia. (P-2)
3-2.86 Demonstrate the examination of the peripheral vascular system. (P-2)
3-2.87 Demonstrate the examination of the musculoskeletal system. (P-2)
3-2.88 Demonstrate the examination of the nervous system. (P-2)

DECLARATIVE

I. Physical examination - approach and overview
  A. Examination techniques and equipment
    1. Examination techniques
      a. Inspection
      b. Palpation
      c. Percussion
      d. Auscultation
    2. Measurement of vitals
      a. Pulse
      b. Respirations
      c. Blood pressure
    3. Height and weight
    4. Equipment
      a. Stethoscope
      b. Ophthalmoscope
      c. Otoscope
      d. Blood pressure cuff
  B. General approach
    1. Examine the patient systematically
    2. Place special emphasis on areas suggested by the present illness and chief complaint
    3. Keep in mind that most patients view a physical exam with apprehension and anxiety - they feel vulnerable and exposed
  C. Overview of a comprehensive examination
    1. The categories of a physical exam should include
      a. Mental status
      b. General survey
      c. Vital signs
      d. Skin
      e. HEENT
        (1) Head
        (2) Eyes
        (3) Ears
        (4) Nose
        (5) Throat
      f. Neck
      g. Chest
      h. Abdomen
      i. Posterior body
      j. Extremities
        (1) Peripheral vascular
        (2) Musculoskeletal
      k. Neurologic exam

II. Mental status
  A. Appearance and behavior
    1. Assess for level of consciousness

a. Alertness
b. Response to verbal stimuli
c. Response to touch or shake of shoulder (tactile)
d. Response to painful stimuli
e. Unresponsive
f. Possible findings
(1) Normal
(2) Drowsiness
(3) Obtundation
(a) Insensitive to unpleasant or painful stimuli by reducing level of consciousness by an anesthetic or analgesic
(4) Stupor
(a) State of lethargy and unresponsiveness
(b) Person seems unaware of surroundings
g. Coma
(1) State of profound unconsciousness
(2) Absence of spontaneous eye movements
(3) No response to verbal or painful stimuli
(4) Patient can not be aroused by any stimuli
h. Posture and motor behavior

2. Observe posture and motor behavior
a. Pace
b. Range
c. Character
d. Appropriateness of movement
e. Possible findings
(1) Normal
(2) Restlessness
(3) Agitation
(4) Bizarre postures
(5) Immobility
(6) Involuntary movements

3. Dress, grooming, and personal hygiene
a. Fastidiousness
b. Neglect

4. Facial expression
a. Anxiety
b. Depression
c. Elation
d. Anger
e. Response to imaginary people or objects
f. Withdrawal

5. Manner, affect, and relation to person and things

B. Speech and language
1. Assess
a. Quantity
b. Rate
c. Loudness

d. Fluency
e. Possible findings
(1) Aphasia
(2) Dysphonia
(3) Dysarthria
(4) Changes with mood disorders

C. Mood
1. Assess
a. Nature
b. Intensity
c. Duration
d. Stability of abnormal mood
e. Risk of suicide
f. Possible findings
(1) Happiness
(2) Elation
(3) Depression
(4) Anxiety
(5) Anger
(6) Indifference

D. Thought and perceptions
1. Assess thought processes
a. Logic
b. Relevance
c. Organization
d. Coherence of thought
e. Possible findings
(1) Loosening of associations
(2) Flight of ideas
(3) Incoherence
(4) Confabulation
(5) Blocking
2. Assess thought content
a. Unusual thoughts
b. Unpleasant thoughts
c. Possible findings
(1) Obsessions
(2) Compulsions
(3) Delusions
(4) Feelings of unreality
3. Assess perceptions
a. Unusual
b. Hearing things
c. Seeing things
d. Possible findings
e. Illusions
f. Hallucinations

E. Assess insight and judgement

1. Insight into illness
2. Level of judgement in making decisions or plans
3. Possible findings
   a. Recognition or denial of mental cause of symptoms
   b. Bizarre, impulsive, or unrealistic judgement

F. Memory and attention
1. Assess orientation
   a. Time
   b. Place
   c. Person
   d. Possible findings
      (1) Disorientation
2. Assess attention
   a. Digit span
   b. Serial sevens
   c. Spelling backwards
3. Assess remote memory (i.e. birthdays)
4. Assess recent memory (i.e. events of the day)
5. Assess new learning ability

III. General survey
A. Level of consciousness
1. Awake
2. Alert
3. Responsive

B. Signs of distress
1. Assess for signs of distress
2. Examples (not inclusive)
   a. Cardiorespiratory insufficiency
      (1) Labored breathing
      (2) Wheezing
      (3) Cough
   b. Pain
      (1) Wincing
      (2) Sweating
      (3) Protectiveness of a painful part
   c. Anxiety
      (1) Anxious face
      (2) Fidgety movement
      (3) Cold moist palms

C. Apparent state of health
1. Acutely or chronically ill
2. Frail
3. Feeble
4. Robust
5. Vigorous

D. Skin color and obvious lesions
1. Pallor

2. Cyanosis
3. Jaundice
4. Rashes
5. Bruises - ecchymosis
6. Scars
7. Discoloration

E. Height and build
1. Unusually tall or short
2. Slender, lanky, muscular or stocky build

F. Sexual development
1. Are the following appropriate for the patient's age and gender
   a. Voice
   b. Hair
      (1) Facial
      (2) Axillary
      (3) Groin
   c. Breast size

G. Weight
1. Emaciated
2. Slender
3. Plump
4. Obese
   a. Concentrated
   b. Distributed evenly
5. Recent history of weight gain or loss

H. Posture, gait and motor activity
1. Preferred posture
   a. Tripodal
   b. Paralysis
   c. Limpness
   d. Ataxia
   e. Restless or quiet
   f. Involuntary motor activity
   g. Ease of walking
      (1) Balance
      (2) Limp
      (3) Discomfort
      (4) Fear of falling
      (5) Abnormal motor pattern

I. Dress, grooming and personal hygiene
1. How is the patient dressed
   a. Appropriate for temperature and weather
   b. Clean
   c. Properly buttoned and zipped
   d. Compare with clothing worn by people of similar age and social group
   e. Shoes
      (1) Clean
      (2) Holes cut in them

(3) Laces tied
(4) Slippers
f. Unusual jewelry
(1) Copper bracelet for arthritis
(2) Medical identification insignia
g. Hair, fingernails and use of cosmetics
(1) Reflect lifestyle, mood, and personality
(2) Grown out hair or nail polish my indicate decreased interest in appearance or help to estimate length of illness
h. Is grooming and hygiene appropriate for the patients age, lifestyle, occupation and socioeconomic group?

J. Odors of breath or body
1. Breath odors may indicate underlying conditions
a. Alcohol/ alcoholic beverage
b. Acetone
c. Infections
d. Liver failure

K. Facial expression
1. Observe expression
2. At rest, during conversation and during the examination

L. Vital signs
1. Blood pressure
2. Respirations
3. Pulse
4. Temperature

M. Additional assessment techniques
1. Pulse oximetry
2. Others

IV. Anatomical regions
A. The skin
1. Anatomy and physiology review
2. Changes with age
3. Techniques of exam
a. Inspect and palpate the skin
(1) Note the following characteristics
(a) Color
i) The red color of oxyhemoglobin and pallor due to lack of oxygen are best seen where the epidermis is thinnest
ii) The fingernails and lips and the mucous membranes of the mouth and palpebral conjunctiva
iii) In dark skinned persons, the palms and the soles may also be useful
(b) Moisture
(c) Temperature
(d) Texture
(e) Mobility and turgor
(f) Lesions

b. Inspect and palpate the fingernails and toenails
(1) Note their color and shape
(2) Note if there are any lesions present
c. Inspect and palpate the hair
(1) Note its quantity, distribution and texture

4. Abnormalities
a. Basic types of skin lesions
b. Skin colors
c. Skin tumors
d. Findings in or near the nails
(1) Clubbing
(2) Paronychia
(3) Onycholysis
(4) Terry's nails
(5) White spots
(6) Transverse white lines
(7) Psoriasis
(8) Beau's lines

B. Head, ears, eyes, nose, and throat

1. Anatomy and physiology review
a. The head
b. The neck
c. The ears
d. The nose
e. The mouth and pharynx
f. The neck
g. Changes with age

2. Techniques of examination
a. The head
(1) The scalp
(a) Part the hair in several places
(b) Look for scaliness, lumps or other lesions
(2) The skull
(a) Observe the general size and contour of the skull
(b) Palpate and inspect note any tenderness, deformities or lumps
(3) The face
(a) Note the facial expression and contours
(b) Observe for asymmetry, involuntary movements, masses and edema
(4) The skin
(a) Observe the skin
(b) Note color, pigmentation, texture, thickness, hair distribution and any lesions
b. The eyes
(1) Methods to assess visual acuity
(a) Print
(b) Finger count at a distance
(c) Distinguish light and dark

(d) Snellen chart

(2) Visual fields by confrontation
- (a) Ask the patient to look at your nose
- (b) With both arms extended and elbows at right angles, the examiner wiggles both index fingers at the same time
- (c) The patient is asked which finger moved
- (d) If patient states both, the visual fields are grossly normal
- (e) Should be performed in all four quadrants
  - i) Left - right
  - ii) Up - down

(3) Position and alignment of the eyes
- (a) Stand in front of the patient and survey the eyes
- (b) Assess for position and alignment

(4) Eyebrows
- (a) Inspect the eyebrows
- (b) Note the quantity and distribution and scaliness of the underlying skin

(5) Eyelids
- (a) Note the position of the eyelids in relation to the eyeballs
- (b) Inspect for the following
  - i) Width of palpebral fissures
  - ii) Edema of the lids
  - iii) Color of the lids
  - iv) Lesions
  - v) Condition and direction of the eyelashes
  - vi) Adequacy with which the eyelids close
  - vii) Drainage

(6) Lacrimal apparatus
- (a) Briefly inspect the regions of the lacrimal gland and lacrimal sac for swelling
- (b) Look for excessive tearing or dryness of the eyes

(7) Conjunctiva and sclera
- (a) Ask the patient to look up as you depress both lower lids with your thumbs, exposing the sclera and conjunctiva
- (b) Inspect the sclera and palpebral conjunctiva for color, note the vascular pattern
- (c) Look for nodules, swelling, or discharge

(8) Cornea and lens
- (a) With oblique lighting, inspect the cornea of each eye for opacities

(9) Iris
- (a) As you inspect the cornea and lens, inspect the iris
  - i) The markings should be clearly defined

(10) Pupils
- (a) Inspect the size, shape and symmetry of the pupils
- (b) Test the pupillary reactions to light
  - i) Look for
    - a) Direct reaction
    - b) Consensual reaction

(11) Extraocular muscles
(a) From about 2 feet in front of the patient, shine a light into the patient's eyes and ask the patient to look at it
(12) Accommodation
(a) Ask the patient to focus on a distant object
(b) Then have the person shift the gaze to a near object
i) Normal response
a) Pupil constriction
b) Convergence of the axes of the light

c. Ophthalmoscope
(1) Tool used by allied health personnel to perform a detailed exam of the eye that requires skill and practice
(2) Used to evaluate the following
(a) Cornea
i) Foreign bodies
ii) Lacerations
iii) Abrasions
iv) Infection
(b) Anterior chamber
i) Cells
ii) Hyphema - blood
iii) Hypopyon - pus
(c) Fundus
i) Retinal vessels
ii) Optic nerve
iii) Retina
(d) Vitreous
(e) Foreign bodies under eyelid

d. The ears
(1) The auricle
(a) Inspect each auricle and surrounding tissue for deformities, lumps and skin lesions, drainage, tenderness, erythema
(2) Mastoid
(a) Discoloration
(b) Tenderness
(3) Otoscope
(a) Tool used by allied health personnel to perform a detailed exam of the ear
(b) Used to evaluate the following
i) Any discharges
ii) Foreign bodies
iii) Redness or swelling
iv) Eardrum
a) Color
b) Contour
c) Fluid or infection behind the drum
d) Perforation
(4) Assess gross auditory acuity

e. The nose
   (1) Inspect the anterior and inferior surface of the nose
      (a) Asymmetry
      (b) Deformity
      (c) Foreign bodies
   (2) Palpate for tenderness
f. The mouth and pharynx
   (1) Inspect the lips, observe color, moisture, note any lumps, ulcers, cracking or scaliness
   (2) Look into the patient's mouth with a good light and a tongue blade, inspect the oral mucosa
   (3) Note the color of the gums and teeth
   (4) Inspect the teeth
   (5) Inspect the color and architecture of the hard palate
   (6) Inspect the tongue
   (7) Inspect the tonsils
g. The neck
   (1) Inspect the neck, noting its symmetry and any masses or scars
   (2) Palpate the lymph nodes
   (3) Inspect and palpate the trachea for any deviation
   (4) Inspect for jugular venous distention
   (5) Inspect the neck for the thyroid gland
   (6) Palpate the thyroid gland from behind
h. Head and cervical spine
      (a) The temporomandibular joint
      (b) The cervical spine
         i) Inspection
         ii) Palpation
            a) Tenderness
            b) Deformities
         iii) Range of motion
            a) Flexion - touch the chin to the chest
            b) Rotation - touch chin to each shoulder
            c) Lateral bending - touch each ear to each shoulder
            d) Extension - put the head back

C. Chest
   1. Anatomy and physiology
   2. Techniques of examination
      a. General approach
         (1) Have the patient expose their chest so that you can see the entire chest
         (2) Proceed in an orderly fashion
            (a) Inspect
            (b) Palpate
            (c) Percuss
            (d) Auscultate
            (e) Compare side to side
         (3) Try to visualize the underlying lobes of the lungs

b. Examination of the thorax and ventilation
   (1) Observe rate, rhythm, depth and effort of breathing
   (2) Check the patient for cyanosis
   (3) Listen to the patient's breathing
   (4) Observe the shape of the chest
c. Examination of the posterior chest
   (1) Inspect noting
      (a) Any deformities or asymmetry
         i) Barrel chest
         ii) Traumatic flail chest
         iii) Funnel chest
         iv) Pigeon chest
         v) Thoracic kyphoscoliosis
      (b) Abnormal retractions
      (c) Impairment of respiratory movement
   (2) Palpate noting
      (a) Any tender areas
      (b) Assessment of observed abnormalities
      (c) Further assessment of respiratory expansion
   (3) Percuss in symmetrical locations noting
      (a) Any area of abnormal percussion note
         i) Percussion notes
            a) Dullness
            b) Resonance
            c) Hyperresonance
      (b) The level of the diaphragm
      (c) Estimate of diaphragmatic excursion
   (4) Auscultate breath sounds
      (a) Normal
         i) Vesicular
         ii) Bronchiovesciular
         iii) Bronchial
         iv) Tracheal
      (b) Added sounds (adventitious lung sounds)
         i) Discontinuous sounds (crackles)
            a) Fine crackles
            b) Course crackles
         ii) Continuous sounds
            a) Wheezes
            b) Rhonchi
         iii) Pleural friction rub
      (c) Diminished or absent
         i) Effusion
         ii) Consolidation
d. Examination of the anterior chest
   (1) Inspect noting
      (a) Any deformities or asymmetry
      (b) Abnormal retractions

(c) Impairment of respiratory movement
(2) Palpate noting
(a) Any tender areas
(b) Assessment of observed abnormalities
(c) Further assessment of respiratory expansion
(3) Percuss in symmetrical locations noting
(a) Any area of abnormal percussion note
(b) The level of the diaphragm
(4) Auscultate
(a) Breath sounds
(b) Added sounds

D. The cardiovascular system
1. Anatomy and physiology
a. Surface projections of the heart great vessels
b. Events in the cardiac cycle
c. Heart murmurs
d. Relation of auscultatory findings to the chest wall
e. The heart as a pump
f. Arterial pulses and blood pressure
g. Jugular vein pressure and pulses
h. Changes with age
2. Techniques of examination
a. The arterial pulse
(1) Heart rate
(2) Rhythm
(3) Amplitude
(4) Bruits and thrills
b. Blood pressure
c. Jugular venous pressure and pulsation
d. The heart
(1) Inspection and palpation of the chest
(2) Auscultation
(a) Listen for the heart tones
i) Locate the point of maximum impulse (PMI)
ii) Listen in the following locations
a) Aortic - second intercostal space to the right of the sternum
b) Pulmonic - second intercostal space to the left of the sternum
c) Third intercostal space
d) Fourth intercostal space
e) Tricuspid - lower left sternal border
f) Mitral - apex of the heart
iii) Listen for the heart tones - note their intensity
a) Listen for the first tone - S_1
b) Listen for the second tone - S_2
c) Listen for extra sounds - murmurs

E. Abdomen

1. Anatomy and physiology review
2. Changes with age
3. Techniques of examination
    a. General approach
        (1) Ideally, the patient should not have a full bladder
        (2) Make the patient comfortable in a supine position
        (3) Before palpation ask the patient to point out any areas of pain - examine these areas last
        (4) Have warm hands, a warm stethoscope and short nails
        (5) Approach slowly and avoid quick, unexpected movements
        (6) Distract the patient as needed with conversation
        (7) Visualize each organ as in the region as you are examining
        (8) Proceed in an orderly manner
            (a) Inspection
            (b) Auscultation
            (c) Percussion
            (d) Palpation
    b. Inspection of the abdomen, including the flanks, noting
        (1) Skin
            (a) Scars
            (b) Striae
            (c) Dilated veins
            (d) Rashes and lesions
            (e) Discoloration
            (f) Ascites
            (g) Herniation
        (2) The umbilicus
            (a) Contour
            (b) Location
            (c) Signs of inflammation or hernia
        (3) The contour of the abdomen
            (a) Bulges
                i) Flat
                ii) Rounded
                iii) Protuberant
                iv) Scaphoid
                v) Bulges at the flanks
                vi) Hernias
            (b) Symmetry
        (4) Peristalsis
        (5) Pulsations
        (6) Ascites
    c. Auscultate
        (1) Listen for bowel sounds
            (a) Note frequency and character
                i) Increased
                ii) Decreased
                iii) Absent

(2) Bruits
d. Palpation
(1) Muscle guarding
(2) Rigidity
(3) Large masses
(4) Tenderness

F. The female genitalia
1. Anatomy and physiology review
2. Changes with age
3. Techniques of examination
a. General approach
(1) This may be awkward or uncomfortable for the patient and the provider
(2) Male examiners are customarily attended by female assistants
(3) Female examiners may choose to work alone
b. Examination
(1) Inspect the external genitalia
(2) Note any
(a) Inflammation
(b) Discharge
(c) Swelling
(d) Lesions
4. Abnormal findings

G. The male genitalia
1. Anatomy and physiology
2. Changes with age
3. Techniques of examination
a. General approach
(1) This may be awkward or uncomfortable for the patient and the provider
(2) Female examiners are customarily attended by male assistants
(3) Male examiners may choose to work alone
b. Examination
(1) Inspect the external genitalia
(2) Note any
(a) Inflammation
(b) Discharge
(c) Swelling
(d) Lesions
4. Abnormal findings

H. Anus
1. Anatomy and physiology
a. Changes with age
2. Techniques of examination
a. General techniques
b. Can be accomplished with the patient in one of several positions
(1) For most patients, the side-lying position is satisfactory
(2) Drape the patient appropriately
(3) Inspect the sacrococcygeal and perineal areas
(a) Look for and note

i) Lumps
ii) Ulcers
iii) Inflammations
iv) Rashes
v) Excoriations
vi) Tenderness

(4) Methods for testing for occult blood

I. Extremities
1. Anatomy and physiology
a. Structure and function of joints
b. Specific joints
c. Changes with age
2. Techniques of examination
a. General approach
(1) Direct your attention to function as well as structure
(2) Assess general appearance, bodily proportions and ease of movement
(3) Note particularly
(a) Limitation in the range of motion
(b) Unusual Increase in the mobility of a joint
(4) In general note
(a) Signs of inflammation
i) Swelling
ii) Tenderness
iii) Increased heat
iv) Redness
v) Decreased function
(b) Crepitus
(c) Deformities
(d) Muscular strength
(e) Symmetry
(f) Atrophy
b. Patient sitting up
(1) Hands and wrist
(a) Range of motion
i) Make a fist with each hand
ii) Extend and spread the fingers
iii) Flex and extend the wrists
iv) With palms down move the hands lateral and medially
(b) Inspection
i) Swelling
ii) Redness
iii) Nodules
iv) Deformities
v) Muscular atrophy
(c) Palpation
i) Feel
a) Medial and lateral aspect of each distal interphalangeal joint (DIP)

b) Proximal interphalangeal joint (PIP)
c) Squeeze the hand from each side between your thumb and fingers compressing the metacarpophalangeal joints (MAPS)
d) Each wrist joint
e) Any area of abnormality

ii) Note
a) Swelling
b) Tenderness
c) Bogginess

(2) Elbows

(a) Range of motion
i) Ask the patient to bend and straighten the elbows
ii) Keep the arms at the sides with elbows flexed
iii) Supination - turn palms up
iv) Pronation - turn palms down

(b) Inspection
i) Support the patient's forearms with your opposite hand so that the elbow is flexed to about 70 degrees
ii) Examine the elbow

(c) Palpation
i) Palpate the grooves between the epicondyle and the olecranon
ii) Press on the lateral and medial epicondyle
iii) Note
a) Tenderness
b) Swelling
c) Thickening

(3) Shoulders and related structures

(a) Range of motion
i) Ask the patient to
a) Raise both arms to a vertical position at the sides of the head
b) External rotation and abduction - place both hands behind the neck with elbows to the side
c) Internal rotation - place both hands behind the small of the back
ii) Cup your hands over the shoulders and note any crepitus

(b) Palpation
i) Palpate the following regions
a) The sternoclavicular joint
b) The acromioclavicular joint
c) The subacromial area
d) The bicipital grove
ii) Note
a) Tenderness
b) Swelling

c. Ankles and feet
(a) Inspection
i) Observe all surfaces of the ankle and feet
ii) Note
a) Deformities
b) Nodules
c) Swelling
d) Calluses
e) Corns
(b) Palpation
i) The anterior aspects of each ankle joint
ii) The Achilles tendon
iii) Metarsophalangeal joints
iv) Note
a) Tenderness
b) Bogginess
c) Swelling
(c) Range of motion
i) The ankle joint
a) Dorsiflex
b) Plantar flex
ii) The traverse tarsal joint
a) Inversion
b) Eversion
iii) The metatarsophalangeal joints
iv) Flexion of the toes
(1) Knees and hips
(a) Inspection of the knees
i) Note alignment and deformity
ii) Observe atrophy of the quadriceps
(b) Palpation of the knees
i) Palpate note
a) Thickening
b) Swelling
(c) Range of motion
i) Ask the patient to bend each knee in turn up to the chest
ii) Note the flexion of the hip and knee
iii) Assess for rotation of the hips
iv) Assess abduction of the hips
(d) Palpation of the hips
i) Palpate the hip joint

J. Peripheral vascular system
1. Anatomy and physiology
a. Arteries
b. Veins
c. The lymphatic system and lymph nodes
d. Fluid exchange and the capillary bed
e. Changes with age

2. Techniques of examination
    a. The arms
        (1) Inspection from fingertips to shoulders noting
            (a) Size
            (b) Symmetry
            (c) Swelling
            (d) Venous pattern
            (e) The color of the skin and nail beds
            (f) Texture of the skin
        (2) Palpation
            (a) The radial pulse
            (b) If you suspect arterial insufficiency, feel for the brachial pulse
            (c) Feel for epitrochlear nodes
    b. Legs
        (1) Patient should be lying down, appropriately draped
        (2) Successful examination cannot be completed with socks or stockings on
        (3) Inspect from the groin and buttocks to the feet, noting
            (a) Size
            (b) Symmetry
            (c) Swelling
            (d) The venous pattern and any venous enlargement
            (e) Pigmentation
            (f) Rashes
            (g) Scars
            (h) Ulcers
            (i) Color and texture of the skin
        (4) Palpate the superficial inguinal nodes
        (5) Palpate the pulses in order to assess arterial circulation
            (a) The femoral pulse
            (b) The popliteal pulse
            (c) The dorsalis pedis pulse
            (d) The posterior tibial pulse
            (e) Note the temperature of the feet and legs
            (f) Look for edema
            (g) Check for pitting edema
                i) Press firmly but gently with your thumb for at least 5 seconds
                    a) Over the dorsum of each foot
                    b) Behind each medial malleolus
                    c) Over the shins
    c. Special techniques
3. Abnormal finding

K. The spine
1. Inspection
    a. From the side note the cervical, thoracic and lumbar curves
    b. Note curvatures
        (1) Lordosis
        (2) Kyphosis

(3) Scoliosis
c. Look for differences in the height of the shoulders
d. Look for differences in the height of the iliac crest
2. Range of motion
a. Flexion - ask the patient to bend forward and touch the toes
(1) Note
(a) Smoothness of movement
(b) Symmetry of movement
(c) Range of motion
(d) Curve in the lumbar area
b. Lateral bending - bend sideways
c. Extension - back backwards toward you
d. Rotation - twist the shoulders one way and then the other
3. Palpation
a. Palpate the spinous process with your thumb
(1) Identify tenderness
b. Palpate in the area of the costovertebral angle
(1) Identify tenderness
4. Abnormal findings

L. The nervous system
1. Anatomy and physiology
a. Central nervous system
b. Peripheral nervous system
c. Spinal reflexes - deep tendon response
d. Motor pathways
e. Sensory pathways
f. Changes with age
2. Techniques of examination
a. General approach
(1) Are right and left sided findings symmetrical
(2) Is this a peripheral or central nervous system problem
(3) Detail of an appropriate neurological exam varies greatly
(4) Components of the neurological exam may be completed during other assessments
(5) It may be best to organize your findings into five categories
(a) Mental status and speech
(b) Cranial nerves
(c) Motor system
(d) Sensory system
(e) Reflexes
b. The cranial nerves
(1) Cranial nerve I - olfactory (sense of smell)
(2) Cranial nerve II - optic
(a) Test visual acuity
(3) Cranial nerves II and III - optic and oculomotor
(a) Inspect the size and shape of the pupils
(b) Test the pupil response to light
(4) Cranial nerves III, IV, and VI

(a) Test the extra-ocular movements in the six cardinal directions of gaze

(5) Cranial nerve V - trigeminal
- (a) Motor
  - i) Ask the patient to clench their teeth while palpating the temporal and masseter muscles
  - ii) Note the strength of muscle contraction
- (b) Sensory
  - i) Explain to the patient what you will do
  - ii) Touch the forehead, checks and jaw on each side for pain sensation

(6) Cranial nerve VII - facial
- (a) Inspect the face at rest and during conversation
  - i) Note symmetry and observe for tics or abnormal movement
- (b) Ask the patient to
  - i) Raise the eyebrows
  - ii) Frown
  - iii) Close both eyes tightly so that you cannot open them; test muscular strength by trying to open them
  - iv) Show both upper and lower teeth
  - v) Smile
  - vi) Puff out both cheeks
  - vii) Note any weakness or asymmetry

(7) Cranial nerve VIII - acoustic
- (a) Assess hearing

(8) Cranial nerves IX and X - glossopharyngeal and vagus

(9) Cranial nerve XI - spinal accessory

(10) Cranial nerve XII - hypoglossal

c. The motor system

(1) Body position
- (a) Observe the position during movement and at rest

(2) Involuntary movements
- (a) Watch for involuntary movements
- (b) Note
  - i) Quality
  - ii) Rate
  - iii) Rhythm
  - iv) Amplitude
- (c) Note relation to
  - i) Posture
  - ii) Activity
  - iii) Fatigue
  - iv) Emotion

(3) Muscle bulk
- (a) Compare the size and contour of the muscles

(4) Muscle tone
- (a) Feel the resistance to passive stretch

(5) Muscle strength
(a) Ask the patient to move actively against your resistance
i) No muscular contraction detected
ii) A barely detectable flicker or trace of contraction
iii) Active movement of the body part with gravity eliminated
iv) Active movement against gravity
v) Active movement against gravity and some resistance
vi) Active movement against full resistance without evident fatigue - this is normal muscle tone
(b) Test flexion
(c) Test extension
(d) Test extension at the wrist
(e) Test the grip
(f) Test finger abduction
(g) Test the opposition of the thumb
(h) Test flexion at the hip
(i) Test adduction at the hips
(j) Test abduction at the hips
(k) Test extension at the hips
(l) Test extension at the knee
(m) Test flexion at the knee
(n) Test dorsi-flexion
(6) Coordination
(a) Rapid alternating movements
(b) Point to point movements
i) Finger-to-nose
ii) Heel-to-shin
(c) Gait
i) Walk heel to toe
ii) Walk on the toes
iii) Walk on the heels
iv) Hop in place
v) Do a shallow knee bend
vi) Rise from a sitting position
(d) Stance
i) The Romberg test
ii) Test for pronator drift

d. The sensory system
(1) General approach
(a) Compare symmetrical areas on the two sides of the body
(b) When testing pain, temperature and touch, compare distal and proximal areas
(c) Assess sensation in relation to dermatomes
(2) Pain
(3) Light touch

3. Abnormal findings

V. The physical examination of infants and children

A. Approach to the patient
B. Techniques of examination

VI. Recording examination findings

UNIT TERMINAL OBJECTIVE

3-2 At the completion end of this unit, the paramedic student will be able to explain the pathophysiological significance of physical exam findings.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

3-2.1 Define the terms inspection, palpation, percussion, auscultation. (C-1)
3-2.2 Describe the techniques of inspection, palpation, percussion, and auscultation. (C-1)
3-2.3 Describe the evaluation of mental status. (C-1)
3-2.4 Evaluate the importance of a general survey. (C-3)
3-2.5 Describe the examination of skin, hair and nails. (C-1)
3-2.6 Differentiate normal and abnormal findings of the assessment of the skin. (C-3)
3-2.7 Distinguish the importance of abnormal findings of the assessment of the skin. (C-3)
3-2.8 Describe the examination of the head and neck. (C-1)
3-2.9 Differentiate normal and abnormal findings of the scalp examination. (C-3)
3-2.10 Describe the normal and abnormal assessment findings of the skull. (C-1)
3-2.11 Describe the assessment of visual acuity. (C-1)
3-2.12 Explain the rationale for the use of an ophthalmoscope. (C-1)
3-2.13 Describe the examination of the eyes. (C-1)
3-2.14 Distinguish between normal and abnormal assessment findings of the eyes. (C-3)
3-2.15 Explain the rationale for the use of an otoscope. (C-1)
3-2.16 Describe the examination of the ears. (C-1)
3-2.17 Differentiate normal and abnormal assessment findings of the ears. (C-3)
3-2.18 Describe the examination of the nose. (C-1)
3-2.19 Differentiate normal and abnormal assessment findings of the nose. (C-3)
3-2.20 Describe the examination of the mouth and pharynx. (C-1)
3-2.21 Differentiate normal and abnormal assessment findings of the mouth and pharynx. (C-3)
3-2.22 Describe the examination of the neck. (C-1)
3-2.23 Differentiate normal and abnormal assessment findings the neck. (C-3)
3-2.24 Describe the survey of the thorax and respiration. (C-1)
3-2.25 Describe the examination of the posterior chest. (C-1)
3-2.26 Describe percussion of the chest. (C-1)
3-2.27 Differentiate the percussion notes and their characteristics. (C-3)
3-2.28 Differentiate the characteristics of breath sounds. (C-3)
3-2.29 Describe the examination of the anterior chest. (C-1)
3-2.30 Differentiate normal and abnormal assessment findings of the chest examination. (C-3)
3-2.31 Describe special examination techniques related to the assessment of the chest. (C-1)
3-2.32 Describe the examination of the arterial pulse including rate, rhythm, and amplitude. (C-1)
3-2.33 Distinguish normal and abnormal findings of arterial pulse. (C-3)
3-2.34 Describe the assessment of jugular venous pressure and pulsations. (C-1)
3-2.35 Distinguish normal and abnormal examination findings of jugular venous pressure and pulsations. (C-3)
3-2.36 Describe the examination of the heart and blood vessels. (C-1)
3-2.37 Differentiate normal and abnormal assessment findings of the heart and blood vessels. (C-3)
3-2.38 Describe the auscultation of the heart. (C-1)
3-2.39 Differentiate the characteristics of normal and abnormal findings associated with the auscultation of the heart. (C-3)
3-2.40 Describe special examination techniques of the cardiovascular examination. (C-1)

3-2.41 Describe the examination of the abdomen. (C-1)
3-2.42 Differentiate normal and abnormal assessment findings of the abdomen. (C-3)
3-2.43 Describe auscultation of the abdomen. (C-1)
3-2.44 Distinguish normal and abnormal findings of the auscultation of the abdomen. (C-3)
3-2.45 Describe the examination of the female genitalia. (C-1)
3-2.46 Differentiate normal and abnormal assessment findings of the female genitalia. (C-3)
3-2.47 Describe the examination of the male genitalia. (C-1)
3-2.48 Differentiate normal and abnormal findings of the male genitalia. (C-3)
3-2.49 Describe the examination of the anus and rectum. (C-3)
3-2.50 Distinguish between normal and abnormal findings of the anus and rectum. (C-3)
3-2.51 Describe the examination of the peripheral vascular system. (C-1)
3-2.52 Differentiate normal and abnormal findings of the peripheral vascular system. (C-3)
3-2.53 Describe the examination of the musculoskeletal system. (C-1)
3-2.54 Differentiate normal and abnormal findings of the musculoskeletal system. (C-3)
3-2.55 Describe the examination of the nervous system. (C-1)
3-2.56 Differentiate normal and abnormal findings of the nervous system. (C-3)
3-2.57 Describe the assessment of the cranial nerves. (C-1)
3-2.58 Differentiate normal and abnormal findings of the cranial nerves. (C-3)
3-2.59 Describe the general guidelines of recording examination information. (C-1)
3-2.60 Discuss the considerations of examination of an infant or child. (C-1)

AFFECTIVE OBJECTIVES
At the completion of this unit, the paramedic student will be able to:

3-2.61 Demonstrate a caring attitude when performing physical examination skills. (A-3)
3-2.62 Discuss the importance of a professional appearance and demeanor when performing physical examination skills. (A-1)
3-2.63 Appreciate the limitations of conducting a physical exam in the out-of-hospital environment. (A-2)

PSYCHOMOTOR OBJECTIVES
At the completion of this unit, the paramedic student will be able to:

3-2.64 Demonstrate the examination of skin, hair and nails. (P-2)
3-2.65 Demonstrate the examination of the head and neck. (P-2)
3-2.66 Demonstrate the examination of the eyes. (P-2)
3-2.67 Demonstrate the examination of the ears. (P-2)
3-2.68 Demonstrate the assessment of visual acuity. (P-2)
3-2.69 Demonstrate the examination of the nose. (P-2)
3-2.70 Demonstrate the examination of the mouth and pharynx. (P-2)
3-2.71 Demonstrate the examination of the neck. (P-2)
3-2.72 Demonstrate the examination of the thorax and ventilation. (P-2)
3-2.73 Demonstrate the examination of the posterior chest. (P-2)
3-2.74 Demonstrate auscultation of the chest. (P-2)
3-2.75 Demonstrate percussion of the chest. (P-2)
3-2.76 Demonstrate the examination of the anterior chest. (P-2)
3-2.77 Demonstrate special examination techniques related to the assessment of the chest. (P-2)
3-2.78 Demonstrate the examination of the arterial pulse including location, rate, rhythm, and amplitude. (P-2)
3-2.79 Demonstrate the assessment of jugular venous pressure and pulsations. (P-2)

3-2.80 Demonstrate the examination of the heart and blood vessels. (P-2)
3-2.81 Demonstrate special examination techniques of the cardiovascular examination. (P-2)
3-2.82 Demonstrate the examination of the abdomen. (P-2)
3-2.83 Demonstrate auscultation of the abdomen. (P-2)
3-2.84 Demonstrate the external visual examination of the female genitalia. (P-2)
3-2.85 Demonstrate the examination of the male genitalia. (P-2)
3-2.86 Demonstrate the examination of the peripheral vascular system. (P-2)
3-2.87 Demonstrate the examination of the musculoskeletal system. (P-2)
3-2.88 Demonstrate the examination of the nervous system. (P-2)

DECLARATIVE

I. Physical examination - approach and overview
  A. Examination techniques and equipment
    1. Examination techniques
      a. Inspection
      b. Palpation
      c. Percussion
      d. Auscultation
    2. Measurement of vitals
      a. Pulse
      b. Respirations
      c. Blood pressure
    3. Height and weight
    4. Equipment
      a. Stethoscope
      b. Ophthalmoscope
      c. Otoscope
      d. Blood pressure cuff
  B. General approach
    1. Examine the patient systematically
    2. Place special emphasis on areas suggested by the present illness and chief complaint
    3. Keep in mind that most patients view a physical exam with apprehension and anxiety - they feel vulnerable and exposed
  C. Overview of a comprehensive examination
    1. The categories of a physical exam should include
      a. Mental status
      b. General survey
      c. Vital signs
      d. Skin
      e. HEENT
        (1) Head
        (2) Eyes
        (3) Ears
        (4) Nose
        (5) Throat
      f. Neck
      g. Chest
      h. Abdomen
      i. Posterior body
      j. Extremities
        (1) Peripheral vascular
        (2) Musculoskeletal
      k. Neurologic exam

II. Mental status
  A. Appearance and behavior
    1. Assess for level of consciousness

a. Alertness
b. Response to verbal stimuli
c. Response to touch or shake of shoulder (tactile)
d. Response to painful stimuli
e. Unresponsive
f. Possible findings
(1) Normal
(2) Drowsiness
(3) Obtundation
(a) Insensitive to unpleasant or painful stimuli by reducing level of consciousness by an anesthetic or analgesic
(4) Stupor
(a) State of lethargy and unresponsiveness
(b) Person seems unaware of surroundings
g. Coma
(1) State of profound unconsciousness
(2) Absence of spontaneous eye movements
(3) No response to verbal or painful stimuli
(4) Patient can not be aroused by any stimuli
h. Posture and motor behavior

2. Observe posture and motor behavior
a. Pace
b. Range
c. Character
d. Appropriateness of movement
e. Possible findings
(1) Normal
(2) Restlessness
(3) Agitation
(4) Bizarre postures
(5) Immobility
(6) Involuntary movements

3. Dress, grooming, and personal hygiene
a. Fastidiousness
b. Neglect

4. Facial expression
a. Anxiety
b. Depression
c. Elation
d. Anger
e. Response to imaginary people or objects
f. Withdrawal

5. Manner, affect, and relation to person and things

B. Speech and language
1. Assess
a. Quantity
b. Rate
c. Loudness

d. Fluency
e. Possible findings
(1) Aphasia
(2) Dysphonia
(3) Dysarthria
(4) Changes with mood disorders

C. Mood
1. Assess
a. Nature
b. Intensity
c. Duration
d. Stability of abnormal mood
e. Risk of suicide
f. Possible findings
(1) Happiness
(2) Elation
(3) Depression
(4) Anxiety
(5) Anger
(6) Indifference

D. Thought and perceptions
1. Assess thought processes
a. Logic
b. Relevance
c. Organization
d. Coherence of thought
e. Possible findings
(1) Loosening of associations
(2) Flight of ideas
(3) Incoherence
(4) Confabulation
(5) Blocking
2. Assess thought content
a. Unusual thoughts
b. Unpleasant thoughts
c. Possible findings
(1) Obsessions
(2) Compulsions
(3) Delusions
(4) Feelings of unreality
3. Assess perceptions
a. Unusual
b. Hearing things
c. Seeing things
d. Possible findings
e. Illusions
f. Hallucinations

E. Assess insight and judgement

1. Insight into illness
2. Level of judgement in making decisions or plans
3. Possible findings
   a. Recognition or denial of mental cause of symptoms
   b. Bizarre, impulsive, or unrealistic judgement

F. Memory and attention
1. Assess orientation
   a. Time
   b. Place
   c. Person
   d. Possible findings
      (1) Disorientation
2. Assess attention
   a. Digit span
   b. Serial sevens
   c. Spelling backwards
3. Assess remote memory (i.e. birthdays)
4. Assess recent memory (i.e. events of the day)
5. Assess new learning ability

III. General survey
A. Level of consciousness
1. Awake
2. Alert
3. Responsive

B. Signs of distress
1. Assess for signs of distress
2. Examples (not inclusive)
   a. Cardiorespiratory insufficiency
      (1) Labored breathing
      (2) Wheezing
      (3) Cough
   b. Pain
      (1) Wincing
      (2) Sweating
      (3) Protectiveness of a painful part
   c. Anxiety
      (1) Anxious face
      (2) Fidgety movement
      (3) Cold moist palms

C. Apparent state of health
1. Acutely or chronically ill
2. Frail
3. Feeble
4. Robust
5. Vigorous

D. Skin color and obvious lesions
1. Pallor

2. Cyanosis
3. Jaundice
4. Rashes
5. Bruises - ecchymosis
6. Scars
7. Discoloration

E. Height and build
1. Unusually tall or short
2. Slender, lanky, muscular or stocky build

F. Sexual development
1. Are the following appropriate for the patient's age and gender
   a. Voice
   b. Hair
      (1) Facial
      (2) Axillary
      (3) Groin
   c. Breast size

G. Weight
1. Emaciated
2. Slender
3. Plump
4. Obese
   a. Concentrated
   b. Distributed evenly
5. Recent history of weight gain or loss

H. Posture, gait and motor activity
1. Preferred posture
   a. Tripodal
   b. Paralysis
   c. Limpness
   d. Ataxia
   e. Restless or quiet
   f. Involuntary motor activity
   g. Ease of walking
      (1) Balance
      (2) Limp
      (3) Discomfort
      (4) Fear of falling
      (5) Abnormal motor pattern

I. Dress, grooming and personal hygiene
1. How is the patient dressed
   a. Appropriate for temperature and weather
   b. Clean
   c. Properly buttoned and zipped
   d. Compare with clothing worn by people of similar age and social group
   e. Shoes
      (1) Clean
      (2) Holes cut in them

(3) Laces tied
(4) Slippers
f. Unusual jewelry
(1) Copper bracelet for arthritis
(2) Medical identification insignia
g. Hair, fingernails and use of cosmetics
(1) Reflect lifestyle, mood, and personality
(2) Grown out hair or nail polish my indicate decreased interest in appearance or help to estimate length of illness
h. Is grooming and hygiene appropriate for the patients age, lifestyle, occupation and socioeconomic group?

J. Odors of breath or body
1. Breath odors may indicate underlying conditions
a. Alcohol/ alcoholic beverage
b. Acetone
c. Infections
d. Liver failure

K. Facial expression
1. Observe expression
2. At rest, during conversation and during the examination

L. Vital signs
1. Blood pressure
2. Respirations
3. Pulse
4. Temperature

M. Additional assessment techniques
1. Pulse oximetry
2. Others

IV. Anatomical regions
A. The skin
1. Anatomy and physiology review
2. Changes with age
3. Techniques of exam
a. Inspect and palpate the skin
(1) Note the following characteristics
(a) Color
i) The red color of oxyhemoglobin and pallor due to lack of oxygen are best seen where the epidermis is thinnest
ii) The fingernails and lips and the mucous membranes of the mouth and palpebral conjunctiva
iii) In dark skinned persons, the palms and the soles may also be useful
(b) Moisture
(c) Temperature
(d) Texture
(e) Mobility and turgor
(f) Lesions

b. Inspect and palpate the fingernails and toenails
(1) Note their color and shape
(2) Note if there are any lesions present
c. Inspect and palpate the hair
(1) Note its quantity, distribution and texture

4. Abnormalities
a. Basic types of skin lesions
b. Skin colors
c. Skin tumors
d. Findings in or near the nails
(1) Clubbing
(2) Paronychia
(3) Onycholysis
(4) Terry's nails
(5) White spots
(6) Transverse white lines
(7) Psoriasis
(8) Beau's lines

B. Head, ears, eyes, nose, and throat

1. Anatomy and physiology review
a. The head
b. The neck
c. The ears
d. The nose
e. The mouth and pharynx
f. The neck
g. Changes with age

2. Techniques of examination
a. The head
(1) The scalp
(a) Part the hair in several places
(b) Look for scaliness, lumps or other lesions
(2) The skull
(a) Observe the general size and contour of the skull
(b) Palpate and inspect note any tenderness, deformities or lumps
(3) The face
(a) Note the facial expression and contours
(b) Observe for asymmetry, involuntary movements, masses and edema
(4) The skin
(a) Observe the skin
(b) Note color, pigmentation, texture, thickness, hair distribution and any lesions
b. The eyes
(1) Methods to assess visual acuity
(a) Print
(b) Finger count at a distance
(c) Distinguish light and dark

(d) Snellen chart

(2) Visual fields by confrontation
- (a) Ask the patient to look at your nose
- (b) With both arms extended and elbows at right angles, the examiner wiggles both index fingers at the same time
- (c) The patient is asked which finger moved
- (d) If patient states both, the visual fields are grossly normal
- (e) Should be performed in all four quadrants
  - i) Left - right
  - ii) Up - down

(3) Position and alignment of the eyes
- (a) Stand in front of the patient and survey the eyes
- (b) Assess for position and alignment

(4) Eyebrows
- (a) Inspect the eyebrows
- (b) Note the quantity and distribution and scaliness of the underlying skin

(5) Eyelids
- (a) Note the position of the eyelids in relation to the eyeballs
- (b) Inspect for the following
  - i) Width of palpebral fissures
  - ii) Edema of the lids
  - iii) Color of the lids
  - iv) Lesions
  - v) Condition and direction of the eyelashes
  - vi) Adequacy with which the eyelids close
  - vii) Drainage

(6) Lacrimal apparatus
- (a) Briefly inspect the regions of the lacrimal gland and lacrimal sac for swelling
- (b) Look for excessive tearing or dryness of the eyes

(7) Conjunctiva and sclera
- (a) Ask the patient to look up as you depress both lower lids with your thumbs, exposing the sclera and conjunctiva
- (b) Inspect the sclera and palpebral conjunctiva for color, note the vascular pattern
- (c) Look for nodules, swelling, or discharge

(8) Cornea and lens
- (a) With oblique lighting, inspect the cornea of each eye for opacities

(9) Iris
- (a) As you inspect the cornea and lens, inspect the iris
  - i) The markings should be clearly defined

(10) Pupils
- (a) Inspect the size, shape and symmetry of the pupils
- (b) Test the pupillary reactions to light
  - i) Look for
    - a) Direct reaction
    - b) Consensual reaction

(11) Extraocular muscles
(a) From about 2 feet in front of the patient, shine a light into the patient's eyes and ask the patient to look at it
(12) Accommodation
(a) Ask the patient to focus on a distant object
(b) Then have the person shift the gaze to a near object
i) Normal response
a) Pupil constriction
b) Convergence of the axes of the light

c. Ophthalmoscope
(1) Tool used by allied health personnel to perform a detailed exam of the eye that requires skill and practice
(2) Used to evaluate the following
(a) Cornea
i) Foreign bodies
ii) Lacerations
iii) Abrasions
iv) Infection
(b) Anterior chamber
i) Cells
ii) Hyphema - blood
iii) Hypopyon - pus
(c) Fundus
i) Retinal vessels
ii) Optic nerve
iii) Retina
(d) Vitreous
(e) Foreign bodies under eyelid

d. The ears
(1) The auricle
(a) Inspect each auricle and surrounding tissue for deformities, lumps and skin lesions, drainage, tenderness, erythema
(2) Mastoid
(a) Discoloration
(b) Tenderness
(3) Otoscope
(a) Tool used by allied health personnel to perform a detailed exam of the ear
(b) Used to evaluate the following
i) Any discharges
ii) Foreign bodies
iii) Redness or swelling
iv) Eardrum
a) Color
b) Contour
c) Fluid or infection behind the drum
d) Perforation
(4) Assess gross auditory acuity

e. The nose
   (1) Inspect the anterior and inferior surface of the nose
      (a) Asymmetry
      (b) Deformity
      (c) Foreign bodies
   (2) Palpate for tenderness
f. The mouth and pharynx
   (1) Inspect the lips, observe color, moisture, note any lumps, ulcers, cracking or scaliness
   (2) Look into the patient's mouth with a good light and a tongue blade, inspect the oral mucosa
   (3) Note the color of the gums and teeth
   (4) Inspect the teeth
   (5) Inspect the color and architecture of the hard palate
   (6) Inspect the tongue
   (7) Inspect the tonsils
g. The neck
   (1) Inspect the neck, noting its symmetry and any masses or scars
   (2) Palpate the lymph nodes
   (3) Inspect and palpate the trachea for any deviation
   (4) Inspect for jugular venous distention
   (5) Inspect the neck for the thyroid gland
   (6) Palpate the thyroid gland from behind
h. Head and cervical spine
      (a) The temporomandibular joint
      (b) The cervical spine
         i) Inspection
         ii) Palpation
            a) Tenderness
            b) Deformities
         iii) Range of motion
            a) Flexion - touch the chin to the chest
            b) Rotation - touch chin to each shoulder
            c) Lateral bending - touch each ear to each shoulder
            d) Extension - put the head back

C. Chest
   1. Anatomy and physiology
   2. Techniques of examination
      a. General approach
         (1) Have the patient expose their chest so that you can see the entire chest
         (2) Proceed in an orderly fashion
            (a) Inspect
            (b) Palpate
            (c) Percuss
            (d) Auscultate
            (e) Compare side to side
         (3) Try to visualize the underlying lobes of the lungs

b. Examination of the thorax and ventilation
   (1) Observe rate, rhythm, depth and effort of breathing
   (2) Check the patient for cyanosis
   (3) Listen to the patient's breathing
   (4) Observe the shape of the chest
c. Examination of the posterior chest
   (1) Inspect noting
      (a) Any deformities or asymmetry
         i) Barrel chest
         ii) Traumatic flail chest
         iii) Funnel chest
         iv) Pigeon chest
         v) Thoracic kyphoscoliosis
      (b) Abnormal retractions
      (c) Impairment of respiratory movement
   (2) Palpate noting
      (a) Any tender areas
      (b) Assessment of observed abnormalities
      (c) Further assessment of respiratory expansion
   (3) Percuss in symmetrical locations noting
      (a) Any area of abnormal percussion note
         i) Percussion notes
            a) Dullness
            b) Resonance
            c) Hyperresonance
      (b) The level of the diaphragm
      (c) Estimate of diaphragmatic excursion
   (4) Auscultate breath sounds
      (a) Normal
         i) Vesicular
         ii) Bronchiovesciular
         iii) Bronchial
         iv) Tracheal
      (b) Added sounds (adventitious lung sounds)
         i) Discontinuous sounds (crackles)
            a) Fine crackles
            b) Course crackles
         ii) Continuous sounds
            a) Wheezes
            b) Rhonchi
         iii) Pleural friction rub
      (c) Diminished or absent
         i) Effusion
         ii) Consolidation
d. Examination of the anterior chest
   (1) Inspect noting
      (a) Any deformities or asymmetry
      (b) Abnormal retractions

(c) Impairment of respiratory movement
(2) Palpate noting
(a) Any tender areas
(b) Assessment of observed abnormalities
(c) Further assessment of respiratory expansion
(3) Percuss in symmetrical locations noting
(a) Any area of abnormal percussion note
(b) The level of the diaphragm
(4) Auscultate
(a) Breath sounds
(b) Added sounds

D. The cardiovascular system
1. Anatomy and physiology
a. Surface projections of the heart great vessels
b. Events in the cardiac cycle
c. Heart murmurs
d. Relation of auscultatory findings to the chest wall
e. The heart as a pump
f. Arterial pulses and blood pressure
g. Jugular vein pressure and pulses
h. Changes with age
2. Techniques of examination
a. The arterial pulse
(1) Heart rate
(2) Rhythm
(3) Amplitude
(4) Bruits and thrills
b. Blood pressure
c. Jugular venous pressure and pulsation
d. The heart
(1) Inspection and palpation of the chest
(2) Auscultation
(a) Listen for the heart tones
i) Locate the point of maximum impulse (PMI)
ii) Listen in the following locations
a) Aortic - second intercostal space to the right of the sternum
b) Pulmonic - second intercostal space to the left of the sternum
c) Third intercostal space
d) Fourth intercostal space
e) Tricuspid - lower left sternal border
f) Mitral - apex of the heart
iii) Listen for the heart tones - note their intensity
a) Listen for the first tone - S_1
b) Listen for the second tone - S_2
c) Listen for extra sounds - murmurs

E. Abdomen

1. Anatomy and physiology review
2. Changes with age
3. Techniques of examination
    a. General approach
        (1) Ideally, the patient should not have a full bladder
        (2) Make the patient comfortable in a supine position
        (3) Before palpation ask the patient to point out any areas of pain - examine these areas last
        (4) Have warm hands, a warm stethoscope and short nails
        (5) Approach slowly and avoid quick, unexpected movements
        (6) Distract the patient as needed with conversation
        (7) Visualize each organ as in the region as you are examining
        (8) Proceed in an orderly manner
            (a) Inspection
            (b) Auscultation
            (c) Percussion
            (d) Palpation
    b. Inspection of the abdomen, including the flanks, noting
        (1) Skin
            (a) Scars
            (b) Striae
            (c) Dilated veins
            (d) Rashes and lesions
            (e) Discoloration
            (f) Ascites
            (g) Herniation
        (2) The umbilicus
            (a) Contour
            (b) Location
            (c) Signs of inflammation or hernia
        (3) The contour of the abdomen
            (a) Bulges
                i) Flat
                ii) Rounded
                iii) Protuberant
                iv) Scaphoid
                v) Bulges at the flanks
                vi) Hernias
            (b) Symmetry
        (4) Peristalsis
        (5) Pulsations
        (6) Ascites
    c. Auscultate
        (1) Listen for bowel sounds
            (a) Note frequency and character
                i) Increased
                ii) Decreased
                iii) Absent

(2) Bruits
d. Palpation
(1) Muscle guarding
(2) Rigidity
(3) Large masses
(4) Tenderness

F. The female genitalia
1. Anatomy and physiology review
2. Changes with age
3. Techniques of examination
a. General approach
(1) This may be awkward or uncomfortable for the patient and the provider
(2) Male examiners are customarily attended by female assistants
(3) Female examiners may choose to work alone
b. Examination
(1) Inspect the external genitalia
(2) Note any
(a) Inflammation
(b) Discharge
(c) Swelling
(d) Lesions
4. Abnormal findings

G. The male genitalia
1. Anatomy and physiology
2. Changes with age
3. Techniques of examination
a. General approach
(1) This may be awkward or uncomfortable for the patient and the provider
(2) Female examiners are customarily attended by male assistants
(3) Male examiners may choose to work alone
b. Examination
(1) Inspect the external genitalia
(2) Note any
(a) Inflammation
(b) Discharge
(c) Swelling
(d) Lesions
4. Abnormal findings

H. Anus
1. Anatomy and physiology
a. Changes with age
2. Techniques of examination
a. General techniques
b. Can be accomplished with the patient in one of several positions
(1) For most patients, the side-lying position is satisfactory
(2) Drape the patient appropriately
(3) Inspect the sacrococcygeal and perineal areas
(a) Look for and note

i) Lumps
ii) Ulcers
iii) Inflammations
iv) Rashes
v) Excoriations
vi) Tenderness

(4) Methods for testing for occult blood

I. Extremities
1. Anatomy and physiology
a. Structure and function of joints
b. Specific joints
c. Changes with age
2. Techniques of examination
a. General approach
(1) Direct your attention to function as well as structure
(2) Assess general appearance, bodily proportions and ease of movement
(3) Note particularly
(a) Limitation in the range of motion
(b) Unusual Increase in the mobility of a joint
(4) In general note
(a) Signs of inflammation
i) Swelling
ii) Tenderness
iii) Increased heat
iv) Redness
v) Decreased function
(b) Crepitus
(c) Deformities
(d) Muscular strength
(e) Symmetry
(f) Atrophy
b. Patient sitting up
(1) Hands and wrist
(a) Range of motion
i) Make a fist with each hand
ii) Extend and spread the fingers
iii) Flex and extend the wrists
iv) With palms down move the hands lateral and medially
(b) Inspection
i) Swelling
ii) Redness
iii) Nodules
iv) Deformities
v) Muscular atrophy
(c) Palpation
i) Feel
a) Medial and lateral aspect of each distal interphalangeal joint (DIP)

b) Proximal interphalangeal joint (PIP)
c) Squeeze the hand from each side between your thumb and fingers compressing the metacarpophalangeal joints (MAPS)
d) Each wrist joint
e) Any area of abnormality

ii) Note
a) Swelling
b) Tenderness
c) Bogginess

(2) Elbows

(a) Range of motion
i) Ask the patient to bend and straighten the elbows
ii) Keep the arms at the sides with elbows flexed
iii) Supination - turn palms up
iv) Pronation - turn palms down

(b) Inspection
i) Support the patient's forearms with your opposite hand so that the elbow is flexed to about 70 degrees
ii) Examine the elbow

(c) Palpation
i) Palpate the grooves between the epicondyle and the olecranon
ii) Press on the lateral and medial epicondyle
iii) Note
a) Tenderness
b) Swelling
c) Thickening

(3) Shoulders and related structures

(a) Range of motion
i) Ask the patient to
a) Raise both arms to a vertical position at the sides of the head
b) External rotation and abduction - place both hands behind the neck with elbows to the side
c) Internal rotation - place both hands behind the small of the back
ii) Cup your hands over the shoulders and note any crepitus

(b) Palpation
i) Palpate the following regions
a) The sternoclavicular joint
b) The acromioclavicular joint
c) The subacromial area
d) The bicipital grove
ii) Note
a) Tenderness
b) Swelling

c. Ankles and feet
(a) Inspection
i) Observe all surfaces of the ankle and feet
ii) Note
a) Deformities
b) Nodules
c) Swelling
d) Calluses
e) Corns
(b) Palpation
i) The anterior aspects of each ankle joint
ii) The Achilles tendon
iii) Metarsophalangeal joints
iv) Note
a) Tenderness
b) Bogginess
c) Swelling
(c) Range of motion
i) The ankle joint
a) Dorsiflex
b) Plantar flex
ii) The traverse tarsal joint
a) Inversion
b) Eversion
iii) The metatarsophalangeal joints
iv) Flexion of the toes
(1) Knees and hips
(a) Inspection of the knees
i) Note alignment and deformity
ii) Observe atrophy of the quadriceps
(b) Palpation of the knees
i) Palpate note
a) Thickening
b) Swelling
(c) Range of motion
i) Ask the patient to bend each knee in turn up to the chest
ii) Note the flexion of the hip and knee
iii) Assess for rotation of the hips
iv) Assess abduction of the hips
(d) Palpation of the hips
i) Palpate the hip joint

J. Peripheral vascular system
1. Anatomy and physiology
a. Arteries
b. Veins
c. The lymphatic system and lymph nodes
d. Fluid exchange and the capillary bed
e. Changes with age

2. Techniques of examination
    a. The arms
        (1) Inspection from fingertips to shoulders noting
            (a) Size
            (b) Symmetry
            (c) Swelling
            (d) Venous pattern
            (e) The color of the skin and nail beds
            (f) Texture of the skin
        (2) Palpation
            (a) The radial pulse
            (b) If you suspect arterial insufficiency, feel for the brachial pulse
            (c) Feel for epitrochlear nodes
    b. Legs
        (1) Patient should be lying down, appropriately draped
        (2) Successful examination cannot be completed with socks or stockings on
        (3) Inspect from the groin and buttocks to the feet, noting
            (a) Size
            (b) Symmetry
            (c) Swelling
            (d) The venous pattern and any venous enlargement
            (e) Pigmentation
            (f) Rashes
            (g) Scars
            (h) Ulcers
            (i) Color and texture of the skin
        (4) Palpate the superficial inguinal nodes
        (5) Palpate the pulses in order to assess arterial circulation
            (a) The femoral pulse
            (b) The popliteal pulse
            (c) The dorsalis pedis pulse
            (d) The posterior tibial pulse
            (e) Note the temperature of the feet and legs
            (f) Look for edema
            (g) Check for pitting edema
                i) Press firmly but gently with your thumb for at least 5 seconds
                    a) Over the dorsum of each foot
                    b) Behind each medial malleolus
                    c) Over the shins
    c. Special techniques
3. Abnormal finding

K. The spine
1. Inspection
    a. From the side note the cervical, thoracic and lumbar curves
    b. Note curvatures
        (1) Lordosis
        (2) Kyphosis

(3) Scoliosis
c. Look for differences in the height of the shoulders
d. Look for differences in the height of the iliac crest
2. Range of motion
a. Flexion - ask the patient to bend forward and touch the toes
(1) Note
(a) Smoothness of movement
(b) Symmetry of movement
(c) Range of motion
(d) Curve in the lumbar area
b. Lateral bending - bend sideways
c. Extension - back backwards toward you
d. Rotation - twist the shoulders one way and then the other
3. Palpation
a. Palpate the spinous process with your thumb
(1) Identify tenderness
b. Palpate in the area of the costovertebral angle
(1) Identify tenderness
4. Abnormal findings

L. The nervous system
1. Anatomy and physiology
a. Central nervous system
b. Peripheral nervous system
c. Spinal reflexes - deep tendon response
d. Motor pathways
e. Sensory pathways
f. Changes with age
2. Techniques of examination
a. General approach
(1) Are right and left sided findings symmetrical
(2) Is this a peripheral or central nervous system problem
(3) Detail of an appropriate neurological exam varies greatly
(4) Components of the neurological exam may be completed during other assessments
(5) It may be best to organize your findings into five categories
(a) Mental status and speech
(b) Cranial nerves
(c) Motor system
(d) Sensory system
(e) Reflexes
b. The cranial nerves
(1) Cranial nerve I - olfactory (sense of smell)
(2) Cranial nerve II - optic
(a) Test visual acuity
(3) Cranial nerves II and III - optic and oculomotor
(a) Inspect the size and shape of the pupils
(b) Test the pupil response to light
(4) Cranial nerves III, IV, and VI

(a) Test the extra-ocular movements in the six cardinal directions of gaze

(5) Cranial nerve V - trigeminal
- (a) Motor
  - i) Ask the patient to clench their teeth while palpating the temporal and masseter muscles
  - ii) Note the strength of muscle contraction
- (b) Sensory
  - i) Explain to the patient what you will do
  - ii) Touch the forehead, checks and jaw on each side for pain sensation

(6) Cranial nerve VII - facial
- (a) Inspect the face at rest and during conversation
  - i) Note symmetry and observe for tics or abnormal movement
- (b) Ask the patient to
  - i) Raise the eyebrows
  - ii) Frown
  - iii) Close both eyes tightly so that you cannot open them; test muscular strength by trying to open them
  - iv) Show both upper and lower teeth
  - v) Smile
  - vi) Puff out both cheeks
  - vii) Note any weakness or asymmetry

(7) Cranial nerve VIII - acoustic
- (a) Assess hearing

(8) Cranial nerves IX and X - glossopharyngeal and vagus

(9) Cranial nerve XI - spinal accessory

(10) Cranial nerve XII - hypoglossal

c. The motor system

(1) Body position
- (a) Observe the position during movement and at rest

(2) Involuntary movements
- (a) Watch for involuntary movements
- (b) Note
  - i) Quality
  - ii) Rate
  - iii) Rhythm
  - iv) Amplitude
- (c) Note relation to
  - i) Posture
  - ii) Activity
  - iii) Fatigue
  - iv) Emotion

(3) Muscle bulk
- (a) Compare the size and contour of the muscles

(4) Muscle tone
- (a) Feel the resistance to passive stretch

(5) Muscle strength
(a) Ask the patient to move actively against your resistance
i) No muscular contraction detected
ii) A barely detectable flicker or trace of contraction
iii) Active movement of the body part with gravity eliminated
iv) Active movement against gravity
v) Active movement against gravity and some resistance
vi) Active movement against full resistance without evident fatigue - this is normal muscle tone
(b) Test flexion
(c) Test extension
(d) Test extension at the wrist
(e) Test the grip
(f) Test finger abduction
(g) Test the opposition of the thumb
(h) Test flexion at the hip
(i) Test adduction at the hips
(j) Test abduction at the hips
(k) Test extension at the hips
(l) Test extension at the knee
(m) Test flexion at the knee
(n) Test dorsi-flexion
(6) Coordination
(a) Rapid alternating movements
(b) Point to point movements
i) Finger-to-nose
ii) Heel-to-shin
(c) Gait
i) Walk heel to toe
ii) Walk on the toes
iii) Walk on the heels
iv) Hop in place
v) Do a shallow knee bend
vi) Rise from a sitting position
(d) Stance
i) The Romberg test
ii) Test for pronator drift

d. The sensory system
(1) General approach
(a) Compare symmetrical areas on the two sides of the body
(b) When testing pain, temperature and touch, compare distal and proximal areas
(c) Assess sensation in relation to dermatomes
(2) Pain
(3) Light touch

3. Abnormal findings

V. The physical examination of infants and children

A. Approach to the patient
B. Techniques of examination

VI. Recording examination findings

UNIT TERMINAL OBJECTIVE

3-3 At the end of this unit, the paramedic student will be able to integrate the principles of history taking and techniques of physical exam to perform a patient assessment.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

3-3.1 Recognize hazards/ potential hazards. (C-1)
3-3.2 Describe common hazards found at the scene of a trauma and a medical patient. (C-1)
3-3.3 Determine hazards found at the scene of a medical or trauma patient. (C-2)
3-3.4 Differentiate safe from unsafe scenes. (C-3)
3-3.5 Describe methods to making an unsafe scene safe. (C-1)
3-3.6 Discuss common mechanisms of injury/ nature of illness. (C-1)
3-3.7 Predict patterns of injury based on mechanism of injury. (C-2)
3-3.8 Discuss the reason for identifying the total number of patients at the scene. (C-1)
3-3.9 Organize the management of a scene following size-up. (C-3)
3-3.10 Explain the reasons for identifying the need for additional help or assistance. (C-1)
3-3.11 Summarize the reasons for forming a general impression of the patient. (C-1)
3-3.12 Discuss methods of assessing mental status. (C-1)
3-3.13 Categorize levels of consciousness in the adult, infant and child. (C-3)
3-3.14 Differentiate between assessing the altered mental status in the adult, child and infant patient. (C-3)
3-3.15 Discuss methods of assessing the airway in the adult, child and infant patient. (C-1)
3-3.16 State reasons for management of the cervical spine once the patient has been determined to be a trauma patient. (C-1)
3-3.17 Analyze a scene to determine if spinal precautions are required. (C-3)
3-3.18 Describe methods used for assessing if a patient is breathing. (C-1)
3-3.19 Differentiate between a patient with adequate and inadequate minute ventilation. (C-3)
3-3.20 Distinguish between methods of assessing breathing in the adult, child and infant patient. (C-3)
3-3.21 Compare the methods of providing airway care to the adult, child and infant patient. (C-3)
3-3.22 Describe the methods used to locate and assess a pulse. (C-1)
3-3.23 Differentiate between locating and assessing a pulse in an adult, child and infant patient. (C-3)
3-3.24 Discuss the need for assessing the patient for external bleeding. (C-1)
3-3.25 Describe normal and abnormal findings when assessing skin color. (C-1)
3-3.26 Describe normal and abnormal findings when assessing skin temperature. (C-1)
3-3.27 Describe normal and abnormal findings when assessing skin condition. (C-1)
3-3.28 Explain the reason for prioritizing a patient for care and transport. (C-1)
3-3.29 Identify patients who require expeditious transport. (C-3)
3-3.30 Describe the evaluation of patient's perfusion status based on findings in the initial assessment. (C-1)
3-3.31 Describe orthostatic vital signs and evaluate their usefulness in assessing a patient in shock. (C-1)
3-3.32 Apply the techniques of physical examination to the medical patient. (C-1)
3-3.33 Differentiate between the assessment that is performed for a patient who is unresponsive or has an altered mental status and other medical patients requiring assessment. (C-3)
3-3.34 Discuss the reasons for reconsidering the mechanism of injury. (C-1)
3-3.35 State the reasons for performing a rapid trauma assessment. (C-1)
3-3.36 Recite examples and explain why patients should receive a rapid trauma assessment. (C-1)
3-3.37 Apply the techniques of physical examination to the trauma patient. (C-1)
3-3.38 Describe the areas included in the rapid trauma assessment and discuss what should be evaluated. (C-1)
3-3.39 Differentiate cases when the rapid assessment may be altered in order to provide patient care. (C-3)
3-3.40 Discuss the reason for performing a focused history and physical exam. (C-1)
3-3.41 Describe when and why a detailed physical examination is necessary. (C-1)
3-3.42 Discuss the components of the detailed physical exam in relation to the techniques of examination. (C-1)

3-3.43 State the areas of the body that are evaluated during the detailed physical exam. (C-1)
3-3.44 Explain what additional care should be provided while performing the detailed physical exam. (C-1)
3-3.45 Distinguish between the detailed physical exam that is performed on a trauma patient and that of the medical patient. (C-3)
3-3.46 Differentiate patients requiring a detailed physical exam from those who do not. (C-3)
3-3.47 Discuss the reasons for repeating the initial assessment as part of the on-going assessment. (C-1)
3-3.48 Describe the components of the on-going assessment. (C-1)
3-3.49 Describe trending of assessment components. (C-1)
3-3.50 Discuss medical identification devices/ systems. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

3-3.51 Explain the rationale for crew members to evaluate scene safety prior to entering. (A-2)
3-3.52 Serve as a model for others explaining how patient situations affect your evaluation of mechanism of injury or illness. (A-3)
3-3.53 Explain the importance of forming a general impression of the patient. (A-1)
3-3.54 Explain the value of performing an initial assessment. (A-2)
3-3.55 Demonstrate a caring attitude when performing an initial assessment. (A-3)
3-3.56 Attend to the feelings that patients with medical conditions might be experiencing. (A-1)
3-3.57 Value the need for maintaining a professional caring attitude when performing a focused history and physical examination. (A-3)
3-3.58 Explain the rationale for the feelings that these patients might be experiencing. (A-3)
3-3.59 Demonstrate a caring attitude when performing a detailed physical examination. (A-3)
3-3.60 Explain the value of performing an on-going assessment. (A-2)
3-3.61 Recognize and respect the feelings that patients might experience during assessment. (A-1)
3-3.62 Explain the value of trending assessment components to other health professionals who assume care of the patient. (A-2)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

3-3.63 Observe various scenarios and identify potential hazards. (P-1)
3-3.64 Demonstrate the scene-size-up. (P-2)
3-3.65 Demonstrate the techniques for assessing mental status. (P-2)
3-3.66 Demonstrate the techniques for assessing the airway. (P-2)
3-3.67 Demonstrate the techniques for assessing if the patient is breathing. (P-2)
3-3.68 Demonstrate the techniques for assessing if the patient has a pulse. (P-2)
3-3.69 Demonstrate the techniques for assessing the patient for external bleeding. (P-2)
3-3.70 Demonstrate the techniques for assessing the patient's skin color, temperature, and condition. (P-2)
3-3.71 Demonstrate the ability to prioritize patients. (P-2)
3-3.72 Using the techniques of examination, demonstrate the assessment of a medical patient. (P-2)
3-3.73 Demonstrate the patient care skills that should be used to assist with a patient who is responsive with no known history. (P-2)
3-3.74 Demonstrate the patient care skills that should be used to assist with a patient who is unresponsive or has an altered mental status. (P-2)
3-3.75 Perform a rapid medical assessment. (P-2)
3-3.76 Perform a focused history and physical exam of the medical patient. (P-2)
3-3.77 Using the techniques of physical examination, demonstrate the assessment of a trauma patient. (P-2)
3-3.78 Demonstrate the rapid trauma assessment used to assess a patient based on mechanism of injury. (P-2)
3-3.79 Perform a focused history and physical exam on a non-critically injured patient. (P-2)

3-3.80 Perform a focused history and physical exam on a patient with life-threatening injuries. (P-2)
3-3.81 Perform a detailed physical examination. (P-2)
3-3.82 Demonstrate the skills involved in performing the on-going assessment. (P-2)

DECLARATIVE

I. Scene size-up/ assessment
  A. Body substance isolation review
    1. Eye protection if necessary
    2. Gloves if necessary
    3. Gown if necessary
    4. Mask if necessary
  B. Scene safety
    1. Definition - an assessment to assure the well-being of the paramedic
    2. Personal protection - Is it safe to approach the patient?
      a. Crash/ rescue scenes
      b. Toxic substances - low oxygen areas
      c. Crime scenes - potential for violence
      d. Unstable surfaces - slope, ice, water
    3. Protection of the patient - environmental considerations
    4. Protection of bystanders - if necessary, help the bystander avoid becoming a patient
    5. Do not enter unsafe scenes
    6. Scenes may be dangerous even if they appear to be safe
  C. Definition - an assessment of the scene and surroundings that will provide valuable information to the paramedic
  D. Mechanism of injury/ nature of illness
    1. Medical
      a. Nature of illness - determine from the patient, family or bystanders why EMS was activated
      b. Determine the total number of patients
      c. If there are more patients than the responding unit can effectively handle, initiate a mass casualty plan
        (1) Obtain additional help prior to contact with patients: law enforcement, fire, rescue, ALS, utilities
        (2) Paramedic is less likely to call for help if involved in patient care
        (3) Begin triage
    2. Trauma
      a. Mechanism of injury - determine from the patient, family or bystanders and inspection of the scene the mechanism of injury
      b. Determine the total number of patients
      c. If there are more patients than the responding unit can effectively handle, initiate a mass casualty plan
        (1) Obtain additional help prior to contact with patients
        (2) Paramedic is less likely to call for help when involved in patient care
        (3) Begin triage
        (4) If the responding crew can manage the situation, consider spinal precautions and continue care

II. Initial assessment
  A. General impression of the patient
    1. The general impression is formed to determine priority of care and is based on the paramedic's immediate assessment of the environment and the patient's chief complaint
    2. Determine if ill, i.e., medical or injured (trauma)
      a. If injured, identify mechanism of injury
      b. If ill, identify nature of illness

3. Age
4. Sex
5. Race

B. Assess the patient and determine if the patient has a life threatening condition
   1. If a life threatening condition is found, treat immediately
   2. Assess nature of illness or mechanism of injury

C. Assess patient's mental status (maintain spinal immobilization if needed)
   1. Levels of mental status (AVPU)
      a. Alert
      b. Responds to verbal stimuli
      c. Responds to painful stimuli
      d. Unresponsive - no gag or cough

D. Assess the patient's airway status
   1. Patent
   2. Obstructed
      a. Suction
      b. Position
      c. Airway adjuncts
      d. Invasive techniques
         (1) ETI
         (2) Multi-lumen airways
         (3) Trans tracheal

E. Assess the patient's breathing
   1. Adequate
   2. Inadequate

F. Assess the patient's circulation
   1. Assess the patient's pulse
   2. Assess if major bleeding is present - if bleeding is present, control bleeding
   3. Assess the patient's perfusion by evaluating skin color, temperature and condition

G. Identify priority patients
   1. Consider
      a. Poor general impression
      b. Unresponsive patients - no gag or cough
      c. Responsive, not following commands
      d. Difficulty breathing
      e. Shock (hypoperfusion)
      f. Complicated childbirth
      g. Chest pain with BP <100 systolic
      h. Uncontrolled bleeding
      i. Severe pain anywhere
      j. Multiple injuries
   2. Expedite transport of the patient

H. Proceed to the appropriate focused history and physical examination

III. Focused history and physical exam - medical patients

A. Responsive medical patients
   1. Assess patient history
      a. Chief complaint
      b. History of present illness
         (1) Attributes of a symptom
            (a) Location

i) Where is it
ii) Does it radiate
(b) Quality
i) What is it like
(c) Quantity or severity
i) How bad is it
(d) Timing
i) When did it start
ii) How long does it last
(e) The setting in which it occurs
i) Emotional response
ii) Environmental factors
(f) Factors that make it better or worse
(g) Associated manifestations

c. Past medical history
d. Current health status

2. Perform physical examination
a. Utilize the techniques of physical examination to
(1) Assess the head as necessary
(2) Assess the neck as necessary
(3) Assess the chest as necessary
(4) Assess the abdomen as necessary
(5) Assess the pelvis as necessary
(6) Assess the extremities as necessary
(7) Assess the posterior body as necessary

3. Assess baseline vital signs
(1) Consider orthostatic vital signs

4. Provide emergency medical care based on signs and symptoms in consultation with medical direction

B. Unresponsive medical patients
1. Perform rapid assessment
2. Utilize the techniques of patient assessment
a. Position patient to protect airway
b. Assess the head
c. Assess the neck
d. Assess the chest
e. Assess the abdomen
f. Assess the pelvis
g. Assess the extremities
h. Assess the posterior aspect of the body

3. Assess baseline vital signs
4. Obtain patient history from bystander, family, friends, and/ or medical identification devices/ services
a. Chief complaint
b. History of present illness
c. Past medical history
d. Current health status

IV. Focused history and physical exam - trauma patients
A. Re-consider mechanism of injury
1. Helps to identify priority patients

2. Helps to guide the assessment
3. Significant mechanism of injury
    a. Ejection from vehicle
    b. Death in same passenger compartment
    c. Falls > 20 feet
    d. Roll-over of vehicle
    e. High-speed vehicle collision
    f. Vehicle-pedestrian collision
    g. Motorcycle crash
    h. Unresponsive or altered mental status
    i. Penetrations of the head, chest, or abdomen
    j. Hidden injuries
        (1) Seat belts
            (a) If buckled, may have produced injuries
            (b) If patient had seat belt on, it does not mean they do not have injuries
        (2) Airbags
            (a) May not be effective without seat belt
            (b) Patient can hit wheel after deflation
            (c) Lift the deployed airbag and look at the steering wheel for deformation
                i) "Lift and look" under the bag after the patient has been removed
                ii) Any visible deformation of the steering wheel should be regarded as an indicator of potentially serious internal injury, and appropriate action should be taken
                iii) Child safety seats
                    a) Injury patterns with airbags
                    b) Proper use in vehicles with airbags
4. Additional infant and child considerations
    a. Falls >10 feet
    b. Bicycle collision
    c. Vehicle in medium speed collision

B. Perform rapid trauma physical examination on patients with significant mechanism of injury to determine life-threatening injuries
1. In the responsive patient, symptoms should be sought before and during the trauma assessment
2. Continue spinal stabilization
3. Reconsider transport decision
4. Assess mental status
5. As you inspect and palpate, look and feel for injuries or signs of injury
6. Examination
    a. Assess the head, inspect and palpate for injuries or signs of injury
    b. Assess the neck, inspect and palpate for injuries or signs of injury
    c. Apply cervical spinal immobilization collar (CSIC) (may use information from the head injury unit at this time)
    d. Assess the chest
    e. Assess the abdomen, inspect and palpate for injuries or signs of injury
    f. Assess the pelvis, inspect and palpate for injuries or signs of injury
    g. Assess all four extremities, inspect and palpate for injuries or signs of injury
    h. Roll patient with spinal precautions and assess posterior body, inspect and

palpate, examining for injuries or signs of injury
i. Look for medical identification devices
j. Assess baseline vital signs
k. Assess patient history
(1) Chief complaint
(2) History of present illness
(3) Past medical history
(4) Current health status

C. For patients with no significant mechanism of injury, e.g., cut finger
1. Perform focused history and physical exam of injuries based on the techniques of examination
2. The focused assessment is performed on the specific injury site
3. Assess baseline vital signs
4. Assess patient history
a. Chief complaint
b. History of present illness
c. Past medical history
d. Current health status

V. Detailed physical exam
A. Patient and injury specific, e.g., cut finger would not require the detailed physical exam
B. Perform a detailed physical examination on the patient to gather additional information
C. General approach
1. Assess patient history
a. Chief complaint
b. History of present illness
c. Past medical history
d. Current health status
2. Examine the patient systematically
3. Place special emphasis on areas suggested by the present illness and chief complaint
4. Keep in mind that most patients view a physical exam with apprehension and anxiety - they feel vulnerable and exposed
D. Overview of the detailed physical exam
1. Mental status
a. Appearance and behavior
b. Posture and motor behavior
c. Speech and language
d. Mood
e. Thought and perceptions
f. Assess thought content
g. Assess perceptions
h. Assess insight and judgement
i. Memory and attention
j. Assess remote memory (i.e. birthdays)
k. Assess recent memory (i.e. events of the day)
l. Assess new learning ability
2. General survey
1. Level of consciousness
2. Signs of distress
3. Apparent state of health

4. Skin color and obvious lesions
5. Height and build
6. Sexual development
7. Weight
8. Posture, gait and motor activity
9. Dress, grooming and personal hygiene
10. Odors of breath or body
11. Facial expression

1. Skin
2. Head
3. Eyes
4. Ears
5. Nose and sinuses
6. Mouth and pharynx
7. Neck
8. Thorax and lungs
9. Cardiovascular system
10. Abdomen
11. Genitalia
12. Anus and rectum
13. Peripheral vascular system
14. Musculoskeletal system
15. Nervous system

E. Recording examination findings
F. Assess baseline vital signs

VI. On-going assessment
A. Repeat initial assessment
1. For a stable patient, repeat and record every 15 minutes
2. For an unstable patient, repeat and record at a minimum every 5 minutes
3. Reassess mental status
4. Reassess airway
5. Monitor breathing for rate and quality
6. Reassess circulation
7. Re-establish patient priorities

B. Reassess and record vital signs
C. Repeat focused assessment regarding patient complaint or injuries
D. Assess interventions
1. Assess response to management
2. Maintain or modify management plan

UNIT TERMINAL OBJECTIVE

3-4 At the end of this unit, the paramedic student will be able to apply a process of clinical decision making to use the assessment findings to help form a field impression.

COGNITIVE OBJECTIVES

At the end of this unit, the paramedic student will be able to:

3-4.1 Compare the factors influencing medical care in the out-of-hospital environment to other medical settings. (C-2)
3-4.2 Differentiate between critical life-threatening, potentially life-threatening, and non life-threatening patient presentations. (C-3)
3-4.3 Evaluate the benefits and shortfalls of protocols, standing orders and patient care algorithms. (C-3)
3-4.4 Define the components, stages and sequences of the critical thinking process for paramedics. (C-1)
3-4.5 Apply the fundamental elements of critical thinking for paramedics. (C-2)
3-4.6 Describe the effects of the “fight or flight” response and the positive and negative effects on a paramedic’s decision making. (C-1)
3-4.7 Summarize the “six Rs” of putting it all together: Read the patient, Read the scene, React, Reevaluate, Revise the management plan, Review performance. (C-1)

AFFECTIVE OBJECTIVES

At the end of this unit, the paramedic student will be able to:

3-4.8 Defend the position that clinical decision making is the cornerstone of effective paramedic practice. (A-3)
3-4.9 Practice facilitating behaviors when thinking under pressure. (A-1)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

I. Introduction and key concepts
- A. The cornerstones of effective paramedic practice
  1. Gathering, evaluating, and synthesizing information
  2. Developing and implementing appropriate patient management plans
  3. Applying judgment and exercising independent decision making
  4. Thinking and working effectively under pressure
- B. The out-of-hospital environment
  1. Unlike other environments where medical care is traditionally rendered
  2. Unique, heavily influenced by factors that don't exist in other medical settings
- C. The spectrum of patient care in out-of-hospital care in the out-of-hospital setting
  1. Obvious, critical life-threats
     a. Major, multi-system trauma
     b. Devastating single system trauma
     c. End stage disease presentations
     d. Acute presentations of chronic conditions
  2. Potential life-threats
     a. Serious, multi-system trauma
     b. Multiple disease etiologies
  3. Non life-threatening presentations
- D. Providing guidance and authority for paramedic action and treatments
  1. Protocols, standing orders, and patient care algorithms
     a. Can clearly define and outline performance parameters
     b. Promote a standardized approach
  2. Limitations of protocols, standing orders and patient care algorithms
     a. Only addresses "classic" patient presentations
        (1) Non-specific patient complaints don't follow model
        (2) Limited clarity of presenting patient problems
     b. Don't speak to multiple disease etiologies
     c. Don't speak to multiple treatment modalities
     d. Promotes linear thinking, "cookbook medicine"

II. Components, stages, and sequence of critical thinking process for paramedics
- A. Concept formation
  1. MOI/ scene assessment
  2. Initial assessment and physical examination
  3. Chief complaint
  4. Patient history
  5. Patient affect
  6. Diagnostic tests
- B. Data interpretation
  1. Data gathered
  2. Paramedic knowledge of anatomy and physiology, and pathophysiology
  3. Paramedic attitude
  4. Previous experience base of the paramedic
- C. Application of principle
  1. Field impression/ working diagnosis

2. Protocols/ standing orders
3. Treatment/ intervention

D. Evaluation
1. Reassessment of patient
2. Reflection in action
3. Revision of impression
4. Protocol/ standing orders
5. Revision of treatment/ intervention

E. Reflection on action
1. Run critique
2. Addition to/ modification of experience base of the paramedic

III. Fundamental elements of critical thinking for paramedics
A. Adequate fund of knowledge
B. Ability to focus on specific and multiple elements of data
C. Ability to gather and organize data and form concepts
D. Ability to identify and deal with medical ambiguity
E. Ability to differentiate between relevant and irrelevant data
F. Ability to analyze and compare similar situations
G. Ability to recall contrary situations
H. Ability to articulate decision making reasoning and construct arguments

IV. Considerations with field application of assessment based patient management
A. The patient acuity spectrum
1. EMS is activated for countless reasons
2. Few out-of-hospital calls constitute true life-threatening emergencies
a. Minor medical and traumatic events require little critical thinking and have relatively easy decision making
b. Patients with obvious life-threats pose limited critical thinking challenges
c. Patients who fall on the acuity spectrum between minor and life-threatening pose the greatest critical thinking challenge

B. Thinking under pressure
1. Hormonal influence i.e. “fight or flight” response impacts paramedic decision making both positively and negatively
a. Enhanced visual and auditory acuity
b. Improved reflexes and muscle strength
c. Impaired critical thinking skills
d. Diminished concentration and assessment ability
2. Mental conditioning is the key to effective performance under pressure
a. Skills learned at a pseudo-instinctive performance level
b. Automatic response for technical treatment requirements

C. Mental checklist for thinking under pressure
1. Stop and think
2. Scan the situation
3. Decide and act
4. Maintain clear, concise control
5. Regularly and continually reevaluate the patient

D. Facilitating behaviors

1. Stay calm, don't panic
2. Assume and plan for the worst; err on the side of the patient
3. Maintain a systematic assessment pattern
4. Balance analysis, data processing and decision making styles
    a. Situation analysis styles - reflective versus impulsive
    b. Data processing styles - divergent versus convergent
    c. Decision making styles - anticipatory versus reactive

E. Situation awareness
1. Reading the scene
2. Reading the patient

F. Putting it all together - "the six Rs"
1. Read the patient
    a. Observe the patient
        (1) Level of responsiveness/ consciousness
        (2) Skin color
        (3) Position and location of patient - obvious deformity or asymmetry
    b. Talk to the patient
        (1) Determine the chief complaint
        (2) New problem or worsening of preexisting condition?
    c. Touch the patient
        (1) Skin temperature and moisture
        (2) Pulse rate, strength, and regularity
    d. Auscultate the patient
        (1) Identify problems with the lower airway
        (2) Identify problems with the upper airway
    e. Status of ABCs - identifying life-threats
    f. Complete and accurate set of vital signs
        (1) Use as triage tool to estimate severity
        (2) Can assist in identifying the majority of life threatening conditions
        (3) Influenced by patient age, underlying physical and medical conditions, and current medications
2. Read the scene
    a. General environmental conditions
    b. Evaluate immediate surroundings
    c. Mechanism of injury
3. React
    a. Address life-threats in the order they are found
    b. Determine the most common and statistically probable cause that fits the patient's initial presentation
    c. Consider the most serious condition that fits the patient's initial presentation
    d. If a clear medical problem is elusive, treat based on presenting signs and symptoms
4. Reevaluate
    a. Focused and detailed assessment
    b. Response to initial management/ interventions
    c. Discovery of less obvious problems
5. Revise management plan
6. Review performance at run critique

UNIT TERMINAL OBJECTIVE

3-5 At the completion of this unit, the paramedic student will be able to follow an accepted format for dissemination of patient information in verbal form, either in person or over the radio.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

3-5.1 Identify the importance of communications when providing EMS. (C-1)
3-5.2 Identify the role of verbal, written, and electronic communications in the provision of EMS. (C-1)
3-5.3 Describe the phases of communications necessary to complete a typical EMS event. (C-1)
3-5.4 Identify the importance of proper terminology when communicating during an EMS event. (C-1)
3-5.5 Identify the importance of proper verbal communications during an EMS event. (C-1)
3-5.6 List factors that impede effective verbal communications. (C-1)
3-5.7 List factors which enhance verbal communications. (C-1)
3-5.8 Identify the importance of proper written communications during an EMS event. (C-1)
3-5.9 List factors which impede effective written communications. (C-1)
3-5.10 List factors which enhance written communications. (C-1)
3-5.11 Recognize the legal status of written communications related to an EMS event. (C-1)
3-5.12 State the importance of data collection during an EMS event. (C-1)
3-5.13 Identify technology used to collect and exchange patient and/ or scene information electronically. (C-1)
3-5.14 Recognize the legal status of patient medical information exchanged electronically. (C-1)
3-5.15 Identify the components of the local EMS communications system and describe their function and use. (C-1)
3-5.16 Identify and differentiate among the following communications systems: (C-3)
- a. Simplex
- b. Multiplex
- c. Duplex
- d. Trunked
- e. Digital communications
- f. Cellular telephone
- g. Facsimile
- h. Computer

3-5.17 Identify the components of the local dispatch communications system and describe their function and use. (C-1)
3-5.18 Describe the functions and responsibilities of the Federal Communications Commission. (C-1)
3-5.19 Describe how an EMS dispatcher functions as an integral part of the EMS team. (C-1)
3-5.20 List appropriate information to be gathered by the Emergency Medical Dispatcher. (C-1)
3-5.21 Identify the role of Emergency Medical Dispatch in a typical EMS event. (C-1)
3-5.22 Identify the importance of pre-arrival instructions in a typical EMS event. (C-1)
3-5.23 Describe the purpose of verbal communication of patient information to the hospital. (C-1)
3-5.24 Describe information that should be included in patient assessment information verbally reported to medical direction. (C-1)
3-5.25 Diagram a basic model of communications. (C-3)
3-5.26 Organize a list of patient assessment information in the correct order for electronic transmission to medical direction according to the format used locally. (C-3)

AFFECTIVE OBJECTIVES
At the end of this unit, the paramedic student will be able to:

3-5.27 Show appreciation for proper terminology when describing a patient or patient condition. (A-2)

PSYCHOMOTOR OBJECTIVES
At the end of this unit, the paramedic student will be able to:

3-5.28 Demonstrate the ability to use the local dispatch communications system. (P-1)
3-5.29 Demonstrate the ability to use a radio. (P-1)
3-5.30 Demonstrate the ability to use the biotelemetry equipment used locally. (P-1)

DECLARATIVE

I. General
- A. The importance of communications when providing EMS
  1. Paramedic functions as one part of a team
  2. Need to effectively communicate patient information and scene assessment
  3. Medical direction
  4. System control and administration
  5. Scene control
- B. The role of verbal, written, and electronic communications in the provision of EMS
  1. Communications between party requesting help and the dispatcher
  2. Communications between the dispatcher and the paramedic
  3. Communications between paramedic in the field and receiving hospital and/ or medical direction physician (on-line)
  4. Communication with receiving hospital personnel (on-arrival)
- C. The phases of communications necessary to complete a typical EMS event
  1. Occurrence
  2. Detection
  3. Notification and response
  4. Treatment and preparation for transport
  5. Preparation for next event
     a. Pre-arrival instructions
     b. Communication on-scene among other providers and with patient
- D. Diagram of a basic model of communications
  1. Idea
  2. Encoder
  3. Sender
  4. Media or channel
  5. Receiver
  6. Decoder
  7. Feedback
- E. The role of proper terminology when communicating during an EMS event
  1. Can shorten transmissions/ narratives
  2. Unambiguous
  3. Common means of communications with other medical professionals
- F. The role of proper verbal communications during an EMS event
  1. Exchange of system information
  2. Exchange of patient information
  3. Medical control
  4. Professionalism
- G. Factors that impede effective verbal communications
  1. Semantic
  2. Technical
- H. Factors which enhance verbal communications
  1. Semantic

2. Technical

I. The importance of proper written communications during an EMS event
   1. Written record of incident
   2. Legal record of incident
   3. Professionalism
   4. Other
      a. Medical audit
      b. Quality improvement
      c. Billing
      d. Data collection

J. Factors which impede effective written communications
   1. Semantic
   2. Technical

K. Factors which enhance written communications
   1. Semantic
   2. Technical

L. Legal status of written communications related to an EMS event
   1. Record of incident
   2. Part of medical record
   3. Confidentiality/ disclosure

M. The importance of data collection during an EMS event
   1. System administration
   2. Research
   3. Quality management - often results in policy change

N. New technology used to collect and exchange patient and/ or scene information electronically
   1. Technology based
   2. Real-time capture of events/ information
   3. Integrated with diagnostic technology
   4. Reduces dependance on traditional means of documentation, i.e. written
   5. Influences role of medical direction
      a. Provides for advanced notification
      b. Potential for reduced time to in-hospital diagnosis and therapy

O. The legal status of patient medical information exchanged electronically
   1. Same status as traditional written documentation
   2. May not have a "paper record" of incident

II. Systems

A. Methodology used for EMS communication
   1. Simplex
      a. Advantages - allows speaker to get message out without interruption
      b. Disadvantages
         (1) Slows process
         (2) More formal
         (3) Takes away ability to discuss case
   2. Multiplex

a. Advantages
(1) Either party can interrupt as necessary
(2) Facilitates discussion
b. Disadvantages
(1) Each end has tendency to interrupt the other
(2) Voice interferes with data transmission

3. Duplex
a. Advantages
(1) Either party can interrupt as necessary
(2) Facilitates discussion
b. Disadvantages - each end has tendency to interrupt the other

4. Trunked
a. Advantages
b. Disadvantages

5. Digital
a. Advantages
b. Disadvantages

6. Cellular telephone
a. Advantages
(1) Less formal
(2) Promotes discussion
(3) Can reduce on-line times,
(4) Physician can speak directly with patient
b. Disadvantages
(1) Geography can interfere with signal
(2) Cell site may be unavailable
(3) External antenna necessary
(4) Problems with denied access to cell (PIN numbers unknown or forgotten)

7. Facsimile
a. Advantages
(1) Provides earlier notification
(2) Produces another piece of medical documentation
b. Disadvantages - must have access to a fax machine (at each end)

8. Computer
a. Advantages
(1) Potential to save retrospective data entry step
(2) Can document in real time
(3) Sort on many categories
(4) Create multiple reporting formats
(5) Provide system data quickly
b. Disadvantages
(1) Subject to limitation of machine and man
(2) Lose flexibility

B. Components of the local dispatch communications system and function

1. Define 9-1-1 and E 9-1-1

2. Public safety access point
    a. Types
    b. Functions
3. Emergency medical dispatcher
    a. Functions
4. Pre-arrival instructions
    a. Purpose
    b. Types
5. System dispatcher
    a. Functions

III. Regulation
A. Functions and responsibilities of the Federal Communications Commission
1. Federal agency established to regulate telecommunications in the U.S.
2. Functions
    a. Licensing
    b. Frequency allocation
    c. Technical standards
    d. Rule making and enforcement

IV. Dispatch
A. The functions of an EMS dispatcher
1. Call taking
2. Alerting and directing response
3. Monitoring and coordinating communications
4. Pre-arrival instructions
5. Maintaining incident record

B. Appropriate information to be gathered by the emergency medical dispatcher
1. Caller's name and call-back number
    a. Enhanced 9-1-1 system
2. Address of event
3. Nature of event
4. Specific event information
    a. Call screening
    b. Pre-arrival instructions

C. The role of Emergency Medical Dispatch in a typical EMS event
1. Part of the EMS system team
2. First contact with the EMS system
3. Coordination of response
4. Coordination of communications
5. Provision of pre-arrival instructions to mitigate event prior to arrival of units
6. Incident data collection

D. The importance of pre-arrival Instructions in a typical EMS event
1. Provides immediate assistance
2. Complements call screening

3. Provides updated information to responding unit(s)
4. May be life sustaining in critical incidents
5. Emotional support for caller/ bystanders/ victim

V. Procedures
   A. Information that should be verbally reported to medical direction
      1. Depends of technology used for transmission
      2. May vary with local protocol
      3. Based on patient priority
      4. Standard format
         a. Efficient use of communications system
         b. Assists medical direction
         c. Assures no significant information is omitted
      5. Information
         a. Unit identification/ provider identification
         b. Description of scene
         c. Patient's age, sex, and approximate weight (for drug orders)
         d. Patient's chief complaint
         e. Associated symptoms
         f. Brief, pertinent history of the present illness/ injury
         g. Pertinent past medical history, medications and allergies
         h. Pertinent physical exam findings
         i. Treatment given so far
         j. Estimated time of arrival at hospital
         k. Other pertinent information
   B. General procedures for exchange of information
      1. Protect privacy of the patient
      2. Use proper unit numbers, hospital numbers, proper names and titles
      3. Do not use slang or profanity
      4. Use standard formats for transmission
      5. Utilize the "echo" procedure when receiving directions from the dispatcher or physician orders
      6. Obtain confirmation that message was received

UNIT TERMINAL OBJECTIVE

3-6 At the completion of this unit, the paramedic student will be able to effectively document the essential elements of patient assessment, care and transport.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

3-6.1 Identify the general principles regarding the importance of EMS documentation and ways in which documents are used. (C-1)
3-6.2 Identify and use medical terminology correctly. (C-1)
3-6.3 Recite appropriate and accurate medical abbreviations and acronyms. (C-1)
3-6.4 Record all pertinent administrative information. (C-1)
3-6.5 Explain the role of documentation in agency reimbursement. (C-1)
3-6.6 Analyze the documentation for accuracy and completeness, including spelling. (C-3)
3-6.7 Identify and eliminate extraneous or nonprofessional information. (C-1)
3-6.8 Describe the differences between subjective and objective elements of documentation. (C-1)
3-6.9 Evaluate a finished document for errors and omissions. (C-3)
3-6.10 Evaluate a finished document for proper use and spelling of abbreviations and acronyms. (C-3)
3-6.11 Evaluate the confidential nature of an EMS report. (C-3)
3-6.12 Describe the potential consequences of illegible, incomplete, or inaccurate documentation. (C-1)
3-6.13 Describe the special considerations concerning patient refusal of transport. (C-3)
3-6.14 Record pertinent information using a consistent narrative format. (C-3)
3-6.15 Explain how to properly record direct patient or bystander comments. (C-1)
3-6.16 Describe the special considerations concerning mass casualty incident documentation. (C-1)
3-6.17 Apply the principles of documentation to computer charting, as access to this technology becomes available. (C-2)
3-6.18 Identify and record the pertinent, reportable clinical data of each patient interaction. (C-1)
3-6.19 Note and record “pertinent negative” clinical findings. (C-1)
3-6.20 Correct errors and omissions, using proper procedures as defined under local protocol. (C-1)
3-6.21 Revise documents, when necessary, using locally-approved procedures. (C-1)
3-6.22 Assume responsibility for self-assessment of all documentation. (C-3)
3-6.23 Demonstrate proper completion of an EMS event record used locally. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

3-6.24 Advocate among peers the relevance and importance of properly completed documentation. (A-3)
3-6.25 Resolve the common negative attitudes toward the task of documentation. (A-3)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

I. Introduction
- A. Importance of documentation
- B. Written record of incident
  1. May be the only source of information for persons subsequently interested in the event
     a. Provides a source for identifying pertinent reportable clinical data from each patient interaction
  2. Legal record of incident
     a. May be used in court proceedings
     b. May be the paramedic's sole source of reference to a case
  3. Professionalism
     a. As a link to subsequent care, documentation may be the only means for paramedics to represent themselves as professionals to certain other health professionals
- C. Other uses of documentation
  1. Medical audit
     a. May be used in run review conferences
     b. Other educational forums
  2. Quality improvement
     a. May be used to tally the individual's performance of patient care procedures and to review individual performance
     b. May be used to identify systems issues regarding quality improvement
  3. Billing and administration
     a. May be used for acquiring the billing and administrative data necessary for economic survival of many EMS agencies
  4. Data collection
     a. May be used for research purposes

II. General considerations
- A. Be familiar with common medical terms, their meaning and their correct spelling
- B. Be familiar with commonly-accepted medical abbreviations and their correct spelling
- C. Be familiar with common industry acronyms
- D. Incident times
  1. Understand the legal purposes of accurate recording of the following incident times
     a. Time of call
     b. Time of dispatch
     c. Time of arrival at the scene
     d. Time(s) of medication administration and certain medical procedures as defined by local protocol
     e. Time of departure from the scene
     f. Time of arrival at the medical facility (when transporting a patient)
     g. Time back in service
- E. Accurately note in the document narrative (and elsewhere, when applicable) medical direction's advice and orders, and the results of implementing that advice and those orders
- F. "Pertinent negatives"
  1. Record "pertinent negative" findings, that is, findings that warrant no medical care or intervention, but which, by seeking them, show evidence of the thoroughness of the

paramedic's examination and history of the event

G. Pertinent oral statements made by patients and other on-scene people
   1. Record statements made which may have an impact on subsequent patient care or resolution of the situation, including reports of
      a. Mechanism of injury
      b. Patient's behavior
      c. First aid interventions attempted prior to the arrival of EMS personnel
      d. Safety-related information, including disposition of weapons
      e. Information of interest to crime scene investigators
      f. Disposition of valuable personal property (e.g. watches, wallets)
   2. Use of quotations
      a. The paramedic should put into quotation marks any statements by patients or others which relate to possible criminal activity or admissions of suicidal intention

H. Record support services used (e.g. helicopter, coroner, rescue/ extrication, etc.)

I. Record use of mutual aid services

III. Elements of a properly written EMS document

A. Accurate
   1. Document accuracy depends on all information provided, both narrative and checkbox, being
      a. Precise
      b. Comprehensive
   2. All checkbox sections of a document must show that the paramedic attended to them, even if a given section was unused on a call
   3. Medical terms, abbreviations and acronyms are properly used and correctly spelled

B. Legible
   1. Legibility means that handwriting, especially in the narrative portion of the document, can be read by others without difficulty
   2. Checkbox marking should be clear and consistent from the top page of the document to all underlying pages

C. Timely - documentation should be completed ideally before the paramedic handles tasks subsequent to the patient interaction

D. Unaltered
   1. While writing the document, should the paramedic make an error, a single line should be drawn through the error, and the area initialed and dated
   2. Should alterations to a document be required after the document has been submitted, see "document revision/ correction" (below)

E. Free of non-professional/ extraneous information
   1. Jargon
   2. Slang
   3. Bias
   4. Libel/ slander
   5. Irrelevant opinion/ impression

IV. Systems of narrative writing

A. Head to toe approach
   1. The narrative uses a comprehensive, consistent physical approach from head to toe

B. Body systems approach

1. The narrative uses a comprehensive review of the primary body systems

C. Call incident approach
D. Patient management approach
E. Other formats
F. Know how to differentiate subjective from objective elements of documentation

V. Special considerations of documentation
A. Documentation of patient's refusal of care and/ or transport
1. When a patient refuses medical care, the paramedic must show in the report the process undergone to come to that conclusion, including
a. The paramedic's advice to the patient
b. The advice rendered by medical direction by telephone or radio
c. Signatures of witness(es) to the event, according to local protocol
d. Complete narrative, including quotations or statements by others
B. Document decisions/ events where care and transportation were not needed
1. If canceled en route, note canceling authority and the time
2. If canceled at scene, note canceling authority and special circumstances (e.g. "On scene officer reported no injuries and asked us to leave the scene - no patient contacts made")
C. Documentation in mass casualty situations
1. In unusual circumstances, comprehensive documentation has to wait until after mass casualties are triaged and transported
2. The paramedic should know and follow local procedures for documentation of mass casualty situations

VI. Document revision/ correction
A. How done
1. Write revisions to documents on separate report forms
2. Note the purpose of the revision, and why the information did not appear on the original document
3. Note the date and time
4. Revisions should be made by the original author of a document
5. When the need for revision is realized, it should be done as soon as possible
B. Acceptable method(s)
1. Corrections
a. Written narrative is appropriate, on a new report form which is then attached to the original
2. Deletions and additions
a. Should not be done on the original report form
b. These should only be done on a new report form
3. Supplemental narratives
a. If more information comes to the paramedic's attention, a supplemental narrative can be written on a separate report form and attached to the original

VII. Consequences of inappropriate documentation
A. Implications to medical care
1. An incomplete, inaccurate, or illegible report may cause subsequent care givers to provide inappropriate care to a patient
B. Legal implications

1. A lawyer considering the merits of an impending lawsuit can be dissuaded from a case when the documentation is done correctly
2. The converse is true if documentation is anything less

C. Timeliness

VIII. Closing

A. The paramedic shall assume responsibility for self-assessment of all documentation

B.P Peer advocacy of proper appreciation for the importance of good documentation

1. Documentation is a maligned task in EMS, but one of utmost importance for a variety of reasons
2. A professional EMS provider appreciates this and strives to set a good example to others regarding the completion of the documentation tasks

C. Respect the confidential nature of an EMS report

D. Principals of documentation are to remain valid regarding computer charting, as that technology becomes available